thermogenesis

MP1100/MP1101 Plasma Freezers

Low Temperature Freezing System for Blood Components

Operator & Service Manual

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Chapter 1
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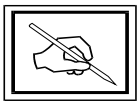
Intended Use

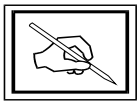


NOTE: There are two types of MicroCascade™ freezers, the MP1100 and MP1101. The only difference between the two models is the certification. The MP1101 is the model CE-certified for sale in Europe. Since operation and service requirements are the same for both freezers, **they will be referred to collectively as "MP1100 Freezer" throughout the manual**.

The ThermoGenesis Corp. MP1100 freezer with MicroCascade™ Refrigeration is intended for the fast, efficient freezing of blood and blood components.

This Operator and Service manual is organized to provide easy access to setup and maintain the MP1100 Freezer. Please read this manual in its entirety.

How to Use This Manual



Key Indicators
The **"Pen-in-Hand"** icon in the sidebar indicates to pay close attention to the indicated text.

The **"Exclamation"** icon in the sidebar indicates a Caution or Warning about a potential hazard. For example: injury to the operator or other personnel and potential damage to the equipment.

The **"Lightning Bolt"** icon in the sidebar indicates a Caution or Warning about a potential electrical hazard. For example: injury to the operator or other personnel and potential damage to the equipment.

The **"Flame"** icon in the sidebar indicates a Caution or Warning about a potential fire or explosion hazard. For example: injury to the operator or other personnel and potential damage to the equipment.

The **"Freeze"** icon in the sidebar indicates a Caution or Warning about a potential hazard to cold or frostbite. For example: injury to the operator or other personnel and potential damage to the equipment.

Text Conventions

To convey information readily and consistently, certain text conventions are used throughout this manual. These conventions are as follows:

TEXT CONVENTION	USED FOR
Numbered Lists	Numbered lists should be carried out in the order listed (for example); 1. Remove the screws from the rear of the motor box. 2. Remove the screws from the Control Panel.
Bulleted Lists	Bulleted Lists indicate items to be carried out, but not necessarily in sequence (for example): • Check the fuses. • Make sure all snap connectors are tight.
Bold Typeface, Uppercase	Calls attention to a **CAUTION, WARNING,** or **DANGER**.
Bold Typeface, lowercase	Emphasizes any **term** or **component** that is being described or referred to.
Italics	Used in designating another section in this Operator and Maintenance Manual that should be consulted (for example): • See *Troubleshooting* – Chapter 6

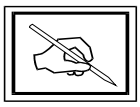
Electrical Safety

CAUTION: The MP1100 Freezer is designed in accordance with Protection Class I (IEC). The chassis of the system is connected to ground by means of a cable, and surfaces on the system that the operator may come in contact with are connected to the chassis by means of screw connections. For protection against electrical hazards, the system must be directly connected to a properly grounded electrical source approved by a qualified electrician. Contact Helmer Technical Service for assistance if you have any questions concerning the electrical connection for the MP1100 Freezer. When servicing the MP1100 Freezer, make sure the power switch is turned off. If unit is hardwired, turn off circuit breaker to unit.

Safety Precautions

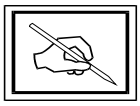
Safety precautions that are necessary when operating, maintaining, and troubleshooting the MP1100 Freezer are outlined below. It is important that these precautions be carefully read and understood. This information should also be made available to new employees.

CAUTION: For greatest assurance of proper and safe operation, keep this manual in a place where it is readily accessible for reference.

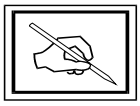


NOTE: During disassembly, keep parts in order to facilitate re-assembly.

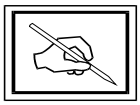
CAUTION: Prior to starting any electrical work, disconnect all power to the freezer.



NOTE: Check all hose and wiring connectors to make sure they are secure and correct.



NOTE: Special tools and materials may be required for certain repairs and maintenance. Be sure to use these tools and materials and follow the proper work procedure.



NOTE: When replacing fuses, be sure the new fuse has correct amperage rating.

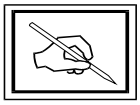
NOTE: General ESD Control Practices should be utilized when servicing or repairing this equipment.

CAUTION – FIRE DANGER: Danger of fire if the vapors from the InstaCoolant IV are allowed to reach 42°C (108°F). For operational purposes THERMOGENESIS CORP. has set the limit on the MP1100 Freezer safety thermostat at 27°C (80°F).

CAUTION – FIRE DANGER: When warming the coolant during a defrost operation, DO NOT PLACE AN ELECTRIC IMMERSION HEATER IN THE COOLANT.

CAUTION: Make sure the InstaCoolant IV is above freezing (0°C (32°F)) before performing any service inside the machine. Placing your hands in the coolant when it is below freezing creates an extreme frostbite danger.

CAUTION: The 508b SUVA 95 is a high-pressure refrigerant. Standard refrigeration components (gauges and hoses) cannot be used with this refrigerant because of the high pressure. When servicing the condensing unit, use protective gloves and protective eyewear to prevent frostbite from exposure to refrigerant.



NOTE: This refrigerant would only need to be checked if all other systems are working, but the freezer is not holding temperature.

CAUTION: The condensing unit should only be serviced by a technician trained in cascade (high-pressure) refrigeration systems.

CAUTION: The user shall be made aware that, if the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

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Disclaimer

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The ThermoGenesis Corp. products described in this manual are covered by specific and limited warranties as described in this chapter.

Contact Information

If there are questions about equipment, service or device warranties, call Helmer Technical Service weekdays (except U.S. holidays) from 8:00 a.m. to 5:00 p.m. Eastern Standard Time. The fax line and website are accessible 24 hours a day.

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Limited Warranty

ThermoGenesis Corp. ("THERMO") products are designed and manufactured to provide reliable, trouble-free performance when properly maintained and used in accordance with the operating instructions provided with each unit. Each unit is carefully inspected, tested and found to be in good working order prior to shipping.

Warranty

THERMO warrants to the original purchaser that the unit will be free from defects in materials or workmanship for one year from the date of shipment. THERMO also warrants that spare parts will be free from defects in material workmanship for a period of ninety (90) days, or the maximum time required by applicable local law, from the date of shipment of the spare part. Equipment failure due to reasons other than manufacturing defects such as accident, misuse or failure to timely perform scheduled maintenance in accordance with the maintenance schedule included with the operating instructions for the unit is excluded from Warranty coverage. This Warranty covers only the cost of parts needed to make Warranty repairs. Labor charges and shipping charges for replacement parts will be billed to the purchaser. THERMO reserves the right to replace any malfunctioning unit or part with a new or refurbished unit in lieu of repairing such unit.

This warranty and THERMO's obligation to repair or replace defective parts is the sole and exclusive remedy of purchaser. Under no circumstances shall THERMO be liable for consequential or economic damages that might arise from a defective part.

NOTE: The use of coolant, other than what is recommended by ThermoGenesis Corp., could void product warranty.

THERMO WARRANTIES, AS SET FORTH HEREIN, ARE EXCLUSIVE AND ARE IN LIEU OF, AND PURCHASER HEREBY WAIVES, ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR WARRANTY OF NON-INFRINGEMENT.

Procedure

If Warranty repairs are needed, contact Helmer Technical Service for emergency repairs at night or on weekends or holidays, contact your THERMO Authorized Service Provider ("Service Provider") directly and notify Helmer Technical Service on the next business day. Failure to notify Helmer Technical Service on the next business day after a request for emergency repairs may result in denial of coverage for that service call.

When calling for service have available: (1) detailed information about the problem; (2) the serial number of the unit; (3) the service record for the unit; (4) the date and place of purchase of the unit.

Limitations

EQUIPMENT OR SPARE PART MALFUNCTIONS OTHER THAN THOSE CAUSED BY DEFECTS IN MATERIALS OR WORKMANSHIP, INCLUDING MALFUNCTIONS CAUSED BY MISUSE, ACCIDENT OR FAILURE TO PERFORM SCHEDULED MAINTENANCE, ARE EXCLUDED FROM COVERAGE. ANY ALTERATIONS OR MODIFICATIONS MADE TO THE UNIT (OTHER THAN MODIFICATIONS OR ALTERNATIONS MADE BY THERMO) RENDER THE WARRANTY NULL AND VOID. THERMO WILL NOT BE RESPONSIBLE FOR ANY CONSEQUENTIAL OR INCIDENTAL DAMAGES RESULTING FROM EQUIPMENT MALFUNCTION OR LOSS OF USE OF THE EQUIPMENT. THERMO MAY AUTHORIZE INDEPENDENT CONTRACTORS TO PERFORM SERVICE. SERVICE PROVIDERS ARE INDEPENDENT CONTRACTORS, NOT THERMO EMPLOYEES. CONSEQUENTLY, THERMO IS NOT RESPONSIBLE FOR THE ACTS OR OMISSIONS OF THE SERVICE PROVIDERS, INCLUDING WITHOUT LIMITATION, FAILURE BY A SERVICE PROVIDER TO RESPOND TO CALLS FOR EMERGENCY SERVICE IN A TIMELY FASHION.

Chapter 2
Overview

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Specifications

FEATURE	SPECIFICATION
Height:	111 cm (44 inches)
Height with lid open:	175 cm (69 inches)
Height with control arm:	185 cm (73 inches)
Width:	201 cm (80 inches)
Depth *(P/N's 8-1100-20/21/23 and 8-1101-20/21/23)*:	82 cm (33 inches)
Depth *(P/N's 8-1100-27 and 8-1101-27)*:	95 cm (38 inches)
Electric defrost heater:	1000 W
Freezer weight:	475 kg (1055 lbs.)
Freezer weight with coolant:	715 kg (1585 lbs.)
Coolant volume:	284 Liters (75 US Gallons)
Compressor refrigerant:	High Side: R-507 (Allied Signal AZ-50) Low Side: R-508b (DuPont SUVA 95)
Compressor operating temperature:	-62°C (-80°F) Saturated Suction Temperature
Condensing unit heat output:	24,000 BTU
Temperature at inlet of condensing unit coil:	<27°C (80°F)
Line voltage / amperage:	200-240V~
Current (Max)	35 A
Frequency	50/60 Hz
Minimum Circuit breaker:	50 A
Noise level:	83 db
Installation Category	II
Vacuum range *(P/N's 8-1100-27 and 8-1101-27 only)*:	10-12 inches vacuum
For Indoor Use Only	

Ambient Operating Temperature

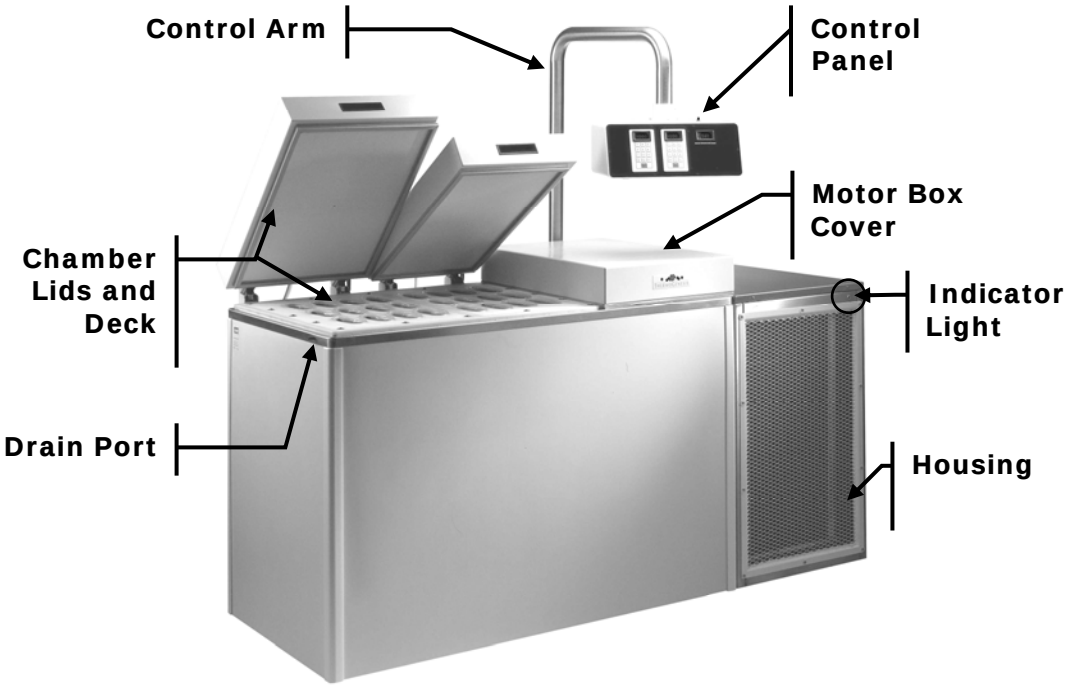
Temperature:	15°C to 27°C (59°F to 80°F)
Relative humidity:	10% to 80% RH
Altitude	≤ 2000m
IP	40
Pollution Degree	2

Overview

The ThermoGenesis Corp. MP1100 Freezer is a low temperature freezing system. Blood components are frozen using a liquid coolant which circulates around specially-designed pockets containing the blood product. The MP1100 Freezer consists of the following components (Figure 2-1):

- MicroCascade™ ultra-low temperature condensing unit
- Two (2) coolant circulating pumps
- Deck and deck heater
- Pockets
- Pocket springs *(P/N's 8-1100-20/21/23 and 8-1101-20/21/23)*
- Primary and secondary power panels
- Control panel

Figure 2-1: *MP1100 Freezer*



Safety Devices

The Safety Thermostat

The MP1100 freezer consistently monitors the temperature of the coolant with a temperature sensor and safety thermostat (see Section *InstaCoolant IV* for a description of the coolant). If the coolant temperature exceeds the safety thermostat temperature setting, the thermostat turns off power to the major components of the freezer, making the freezer inoperable. To adjust the safety thermostat (see Section *Safety Thermostat* – Chapter 7).

Two situations can cause the safety thermostat to turn off power to the major components of the freezer:

1. During equipment installation, when the coolant is added to the freezer, it is most likely at room temperature or about 24ºC (75ºF). If the thermostat sensor detects the coolant is above 27ºC (80ºF), it automatically shuts off power to the major components of the freezer as a safety measure.
2. During a programmed defrost operation, the defrost heater warms the coolant from its chilled temperature to about 3ºC–5°C (37ºF–41ºF). If the defrost heater does not shut off and keeps warming the coolant, the safety thermostat will automatically shut off power to the major components when coolant reaches 27°C (80°F).

Major Components of the Freezer

Refrigeration System

The MP1100 Freezer is equipped with an ultra low temperature refrigeration system.

Motor Box

Located at the right side of the freezer, the motor box contains the two (2) coolant circulating pumps, electrical components, safety thermostat, connection for the electrical defrost heating element and the inlet/exhaust fans for cooling the motorbox compartment.

Circulation Pumps

Located in the motor box compartment, the coolant circulating pumps provide InstaCoolant IV to the freezing chambers during a freeze cycle. Each pump runs independently of the other. If the unit is not being used, the left pump motor will start if the refrigeration comes on to circulate the coolant and maintain a consistent temperature.

NOTE: In order to maintain a consistent temperature when the condensing unit is on, the pump motor will start filling and circulating coolant in the left chamber until set operating temperature is reached. To remove or insert product during this process, start a cycle in the right chamber.

Deck and Pockets

The deck of the MP1100 Freezer is located under the two left-hand lids and contains the pockets in which the blood products are placed for freezing (Figures 2-2 – 2-5). The pockets are made of a polyurethane material capable of maintaining flexibility at low temperatures. The pockets hang down into the two chambers and during a freezing cycle provide the enclosure for the blood products during coolant circulation. The deck and pockets provide a tight seal to insulate the low temperature reservoir from the warmer room environment.

Figure 2-2: *Deck for P/N 8-1100-20 and 8-1101-20*

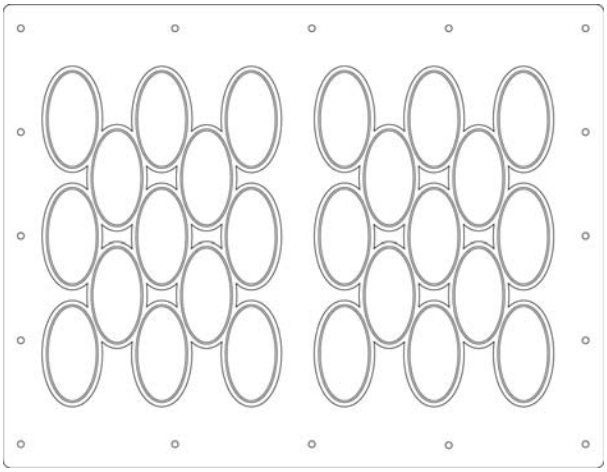


Figure 2-3: *Deck for P/N 8-1100-21 and 8-1101-21*

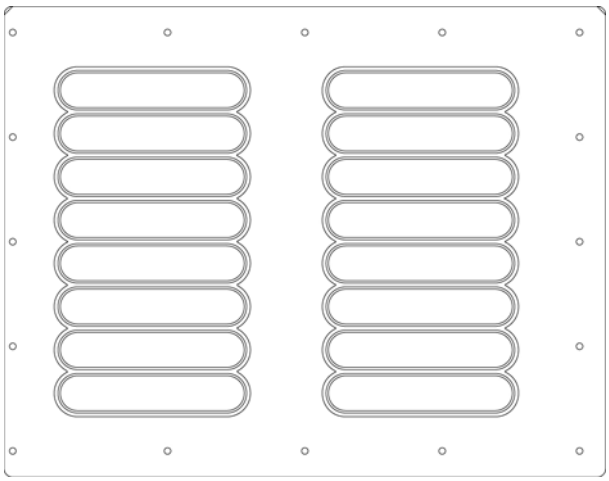


Figure 2-4: *Deck for P/N 8-1100-23 and 8-1101-23*

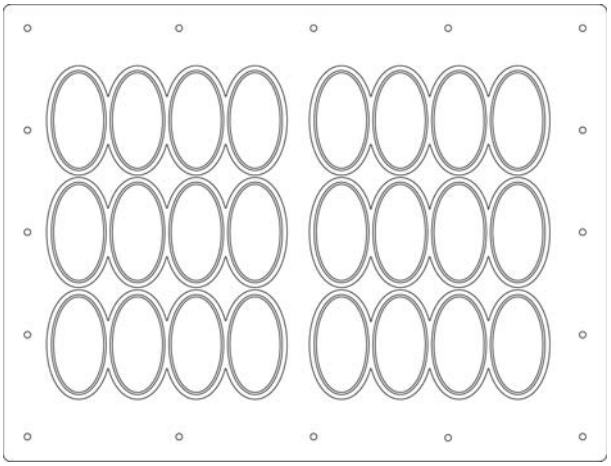
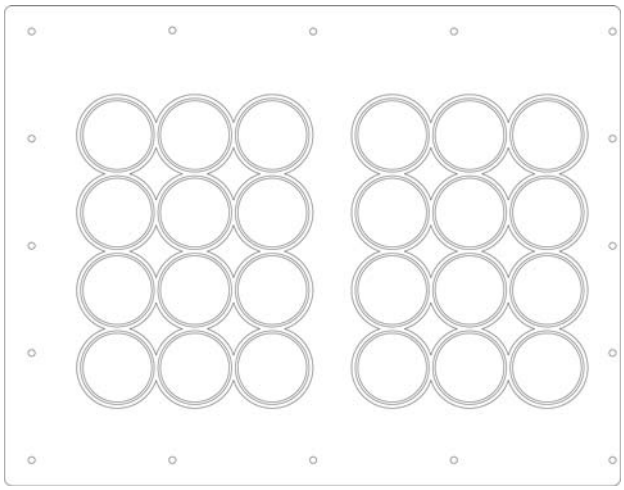


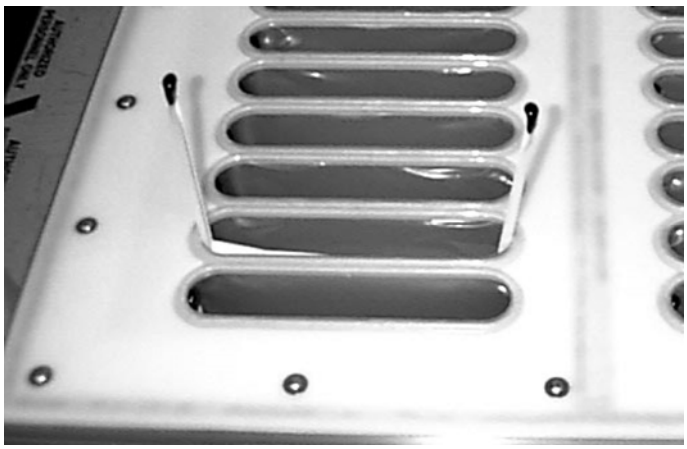
Figure 2-5: *Deck for P/N 8-1100-27 and 8-1101-27*



The Pocket Springs *(available for P/N's 8-1100-20/21/23 and 8-1101-20/21/23 only)*

The pocket spring is a metal insert that acts as a stiffener for the pocket and provides easy access for inserting and removing the bags (Figure 2-6). The pocket spring adds tension to the pocket producing a consistently flat, frozen bag, while decreasing freeze time.

Figure 2-6: *Pocket spring*

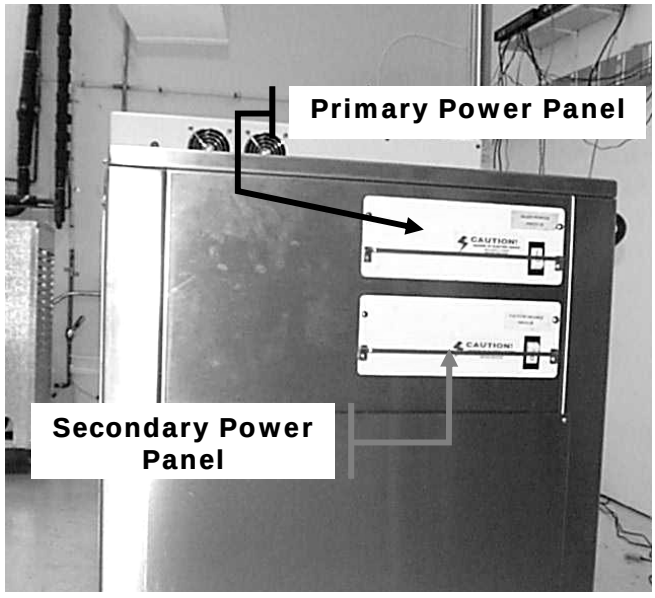


Freezing Chambers

Located below the deck are the two freezing chambers. During the freezing cycle, these chambers are filled with low temperature InstaCoolant IV that circulates around the pockets, freezing the blood components.

Power Panels
Located on the housing at the right end of the freezer, these panels contain the electronics that operate the freezer (Figure 2-7). The main power switch is located on the primary power panel and the vacuum disable switch is located on the secondary power panel. Fuses for the various electrical components are located in these two panels.

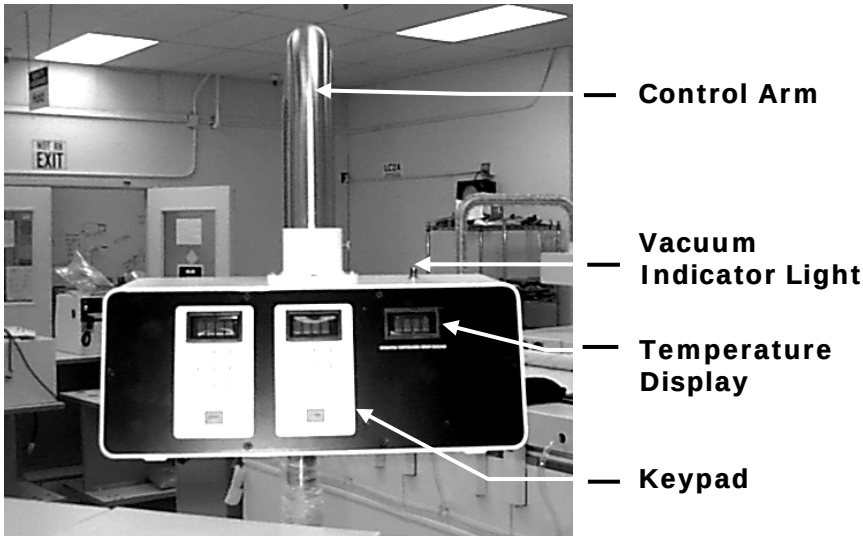
Figure 2-7: *Power panels*



Control Panel
The control panel is located on the control arm (Figure 2-8). The commands for operation, defrost, calibration and temperature setpoint are entered using the keypads. Error messages are shown on the temperature display.

Vacuum System *(available for P/N's 8-1100-27 and 8-1101-27 only)*
The vacuum system expands the pocket to allow for easy insertion of bottles.

Figure 2-8: *Control arm and control panel*



Indicator Lights – Coolant Overtemperature Light
Located at the front, right end of the machine in the upper right corner of the housing is a small red light. When lit, this light indicates that the safety thermostat has shut off power to the major components of the freezer due to high coolant temperature.

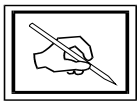
Indicator Lights – Vacuum Indicator Light
Located on top of the control panel is the vacuum indicator light. This light (when not illuminated) indicates that the vacuum system has been turned off or falls below 10" of vacuum. When this light is illuminated, it indicates that the operator may load or unload the blood components.

NOTE: The vacuum indicator light is activated only on P/N's 8-1100-27 and 8-1101-27.

InstaCoolant IV

InstaCoolant IV is a silicone based heat transfer fluid specifically designed for use in low temperature systems. While the fluid operating range is -100ºC to 260ºC (-150ºF to 500ºF), the vapors of the fluid have a flashpoint[1] at 42ºC (108ºF).

[1] The lowest temperature at which the vapor of a combustible liquid can be made to ignite momentarily in air. This assumes an ignition source is present such as a flame or electric heater element.



NOTE: ThermoGenesis Corp. provides a safety thermostat that automatically shuts off power to the major components of the freezer when the coolant temperature exceeds the safety temperature setting. ThermoGenesis Corp. sets the safety temperature limit at 27°C (80°F).

Installation, Service and Maintenance Forms

The forms shown in Appendix A are checklists designed to aid the user in installation, service, and maintenance of the MP1100 Freezer.

Chapter 3
Installation

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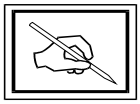
Unpacking and Inspection

Check for any shipping damage upon receiving the freezer. If there is any apparent damage, notify the shipping company immediately. Contact Helmer Technical Service if there are any problems.

The following items are **included with the freezer**:

1 75 Gallons (284 liters) InstaCoolant IV
2 Spare Pockets
1 Control Panel Housing and Control Panel
1 Control Arm
1 Accessories Kit



NOTE: Each MP1100 requires 75 gallons of coolant. Coolant is shipped in five boxes (22 gallons total) and one 55-gallon drum containing 53 gallons.

Please record the following information from the back of the freezer in the spaces marked below:

Part Number: _____

Serial Number: _____

Date of Purchase: _____

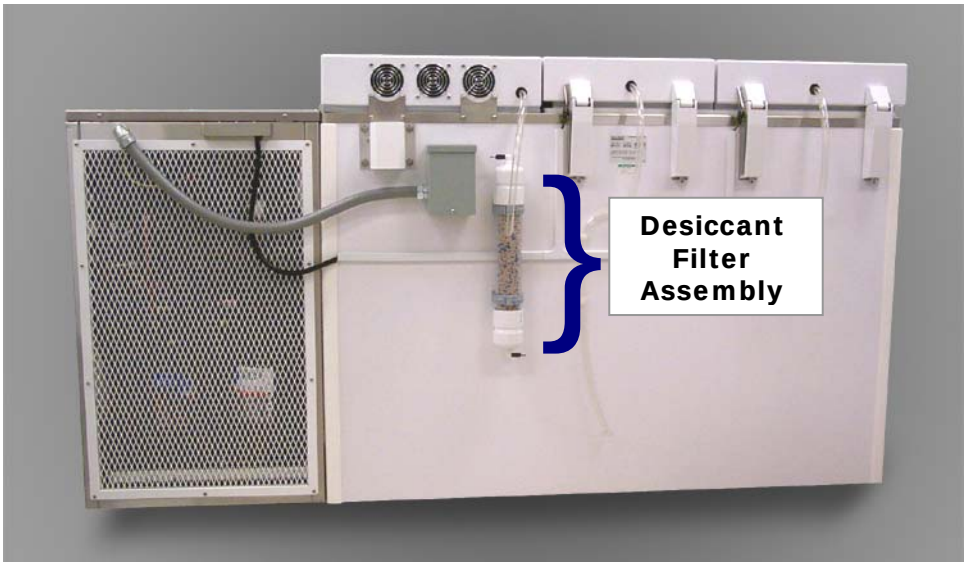
Connecting the Desiccant Filter Assembly — *P/N's 8-1100-20/21/23 and 8-1101-20/21/23 only*

The Desiccant Filter System on the MP1100 Freezer is located on the back of the freezer. Before placing the freezer in position, it is necessary to connect the desiccant filter tubing.

To connect the desiccant filter tubing:

1. Remove the plastic protective caps from the inlet and outlet of the couplings attached to the desiccant filter.
2. Slide the tubing from the lid onto the inlet fitting on the bottom coupling of the desiccant filter (Figure 3-1).
3. Slide the tubing from the chassis to the outlet fitting on top of the coupling of the desiccant filter (Figure 3-1).

Figure 3-1:
Desiccant Filter assembly (control arm and control panel not installed)



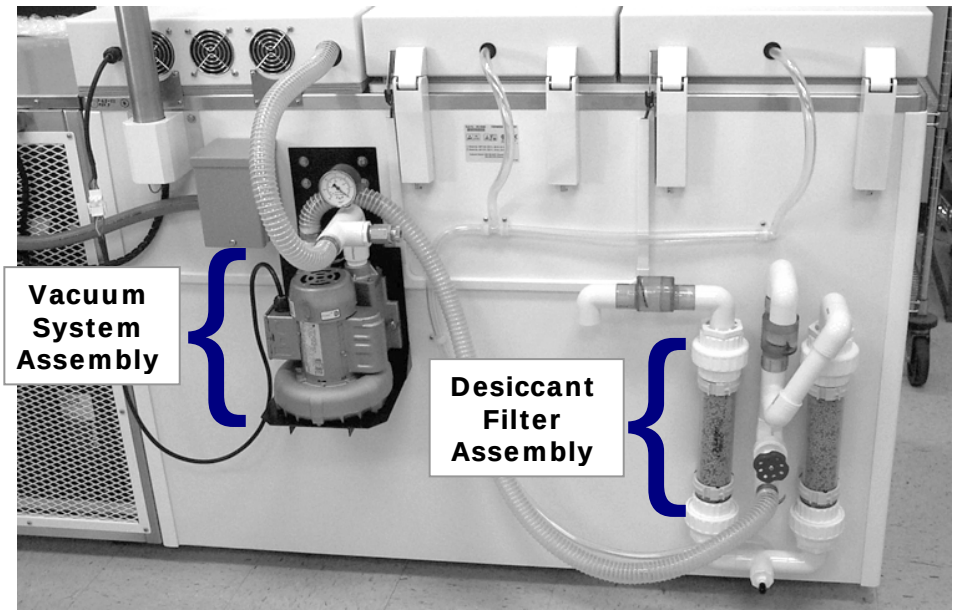
Connecting Desiccant Filter Assembly and Vacuum Pump — *P/N's 8-1100-27 and 8-1101-27 only*

The vacuum pump and the desiccant filter assembly on the MP1100 Freezer are located on the back of the unit. Before placing the freezer in position, it is necessary to connect these assemblies. The vacuum pump assembly should be mounted on the rear-upper-left of the freezer. The desiccant filter assembly should be mounted on the rear, lower, right side of the freezer (Figure 3-2).

To install vacuum pump assembly:

1. First, unscrew the four ¼-20x3/4 hex bolts from the rear of the unit (hex bolts located next to the power junction box).
2. Next, position the vacuum pump into place – while aligning the four ¼-20 tap holes. Torque the four ¼-20x3/4 hex bolts to 47 +/- 3 in-lb.
3. Plug vacuum pump connector to "pig-tail" connector on rear on motor box cover assembly (left side).
4. The reinforced, spiral tubing coming out of the motor box cover (from rear) should be assembled onto the "inlet" port of the vacuum pump. Secure the tubing tightly with the supplied adjustable clamp.

Figure 3-2: *Desiccant filter and vacuum system arrangement*



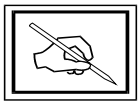
To install desiccant filter assembly:

1. Unscrew the four #10x1 self-tapping screws from the rear of the unit (screws located on the rear-lower –right of the unit).
2. With the desiccant filter clip on hand, thread self-tapping screw through the hole of clip (1 screw / clip, total 4 times). Secure the clip to rear of freezer unit, as depicted. Hand-tighten all four desiccant clips into place.
3. Snap desiccant filter assembly onto clip.
4. With the supplied 50" long reinforced, spiral tubing, attach one end to the inlet of the desiccant filter (the 1" PVC pipe location beneath the gate valve). Secure tightly using the supplied adjustable clamp.
5. Attach other end of tubing to the "outlet" port of the vacuum pump. Again, secure tightly with one of the supplied adjustable clamp.
6. Remove the plastic protective cap on the desiccant filter assembly – exposing the barbed portion of the fitting. Attach the free end of the clear flexible tubing (the one tubing in conjunction with the lids) to the barbed portion of the fitting.

Placing the Freezer in Position

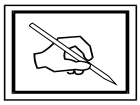
The MP1100 freezer must be located on a level floor. The freezer must be located in a room where the ambient temperature is in

the range of 15°C to 26°C (59°F to 79°F) with the condensing unit running and the humidity is in the range of 10% to 60% RH. Under no circumstances is the MP1100 to be located in an outside environment (see Section *Specifications* – Chapter 2).

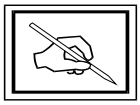


NOTE: This freezer puts out approximately 24,000 BTU heat output while the condensing unit is operating. Use this heat output specification, along with any other equipment in the room, when calculating the amount air conditioning needed to conform to the operating temperature requirements.

CAUTION: DO NOT add InstaCoolant IV to the freezer before placing the freezer in its final location.



NOTE: For ease of movement and accessibility to the place of location allow 4" (15 cm) clearance on both sides of the freezer when passing through passageways and doorways.



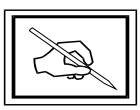
NOTE: There must be at least 18" (46 cm) clearance from the back and left side of the freezer to any wall to allow for adequate ventilation. There must be 36" (91 cm) between the wall and right side of the freezer to service the condensing unit. If adjacent equipment is also putting out heat, additional space may be required.

(For P/N's 8-1100-27 and 8-1101-27) There needs to be enough space to read the vacuum system gauge located on the back of the freezer.

Contact Helmer Technical Service for assistance with additional space requirements.

CAUTION: Make sure the Power Switch is in the OFF position before connecting to the power supply.

Once the freezer is in position lower the leveling feet. There will only be about 1/2" to level the unit with the feet. If more is needed to level the unit, the unit may need to be relocated or call Helmer Technical Service for help.



NOTE: Level the freezer, both side to side and front to back by placing a level on the top of the freezer and adjusting the leveling feet up or down.

Electrical Installation and Specifications

A qualified electrician should wire the power source of the freezer. The unit shall be wired directly to a minimum circuit plug of 50 amps or a 60 amp disconnect at the wall, by a qualified technician. The electrician will need to supply an electrical line of ten feet in length. This power cord will need to be colored as follows:

- USA, L1=Blue (Hot), L2=Brown (Hot), L3=Yellow/Green (Ground)
- Europe, L1=Brown (Hot), L2=Blue (Neutral), L3=Yellow/Green (Ground)
- The freezer requires a 50 amp dedicated circuit (See Section *Specifications* – Chapter 2).

CAUTION: A qualified electrician must survey the existing power availability to verify the electrical capabilities at your facility.

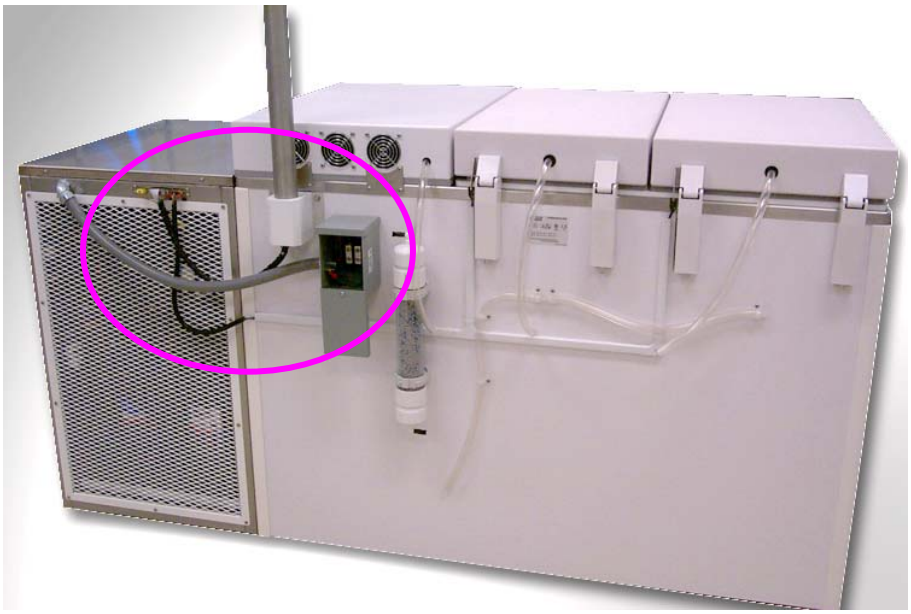
Installing the Control Arm and Control Panel Housing

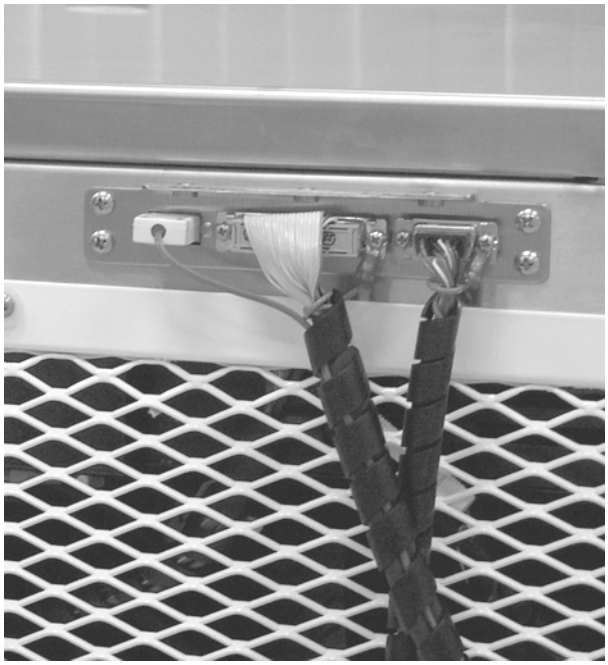
The control panel housing for the MP1100 Freezer is located on a control arm that holds the control panel at eye level for easy viewing and can swivel out of the way to service the motor box cover.

Install control arm and control panel by following the steps below:

1. Remove the plastic wrap from the control arm.
2. Make sure the wiring bundle extends out each end of the control arm.
3. At the back of the freezer, thread the wiring bundle through the support and slide the control arm in place. Tighten the setscrew of the support so that it engages the slot of the arm. This will limit the throw of the control arm (Figure 3-3).
4. Unwrap the control panel housing, slide it on to the control arm and tighten the setscrew to hold the control panel housing in place (Figure 3-3).

Figures 3-3, 3-4:
Control Arm Wiring Detail



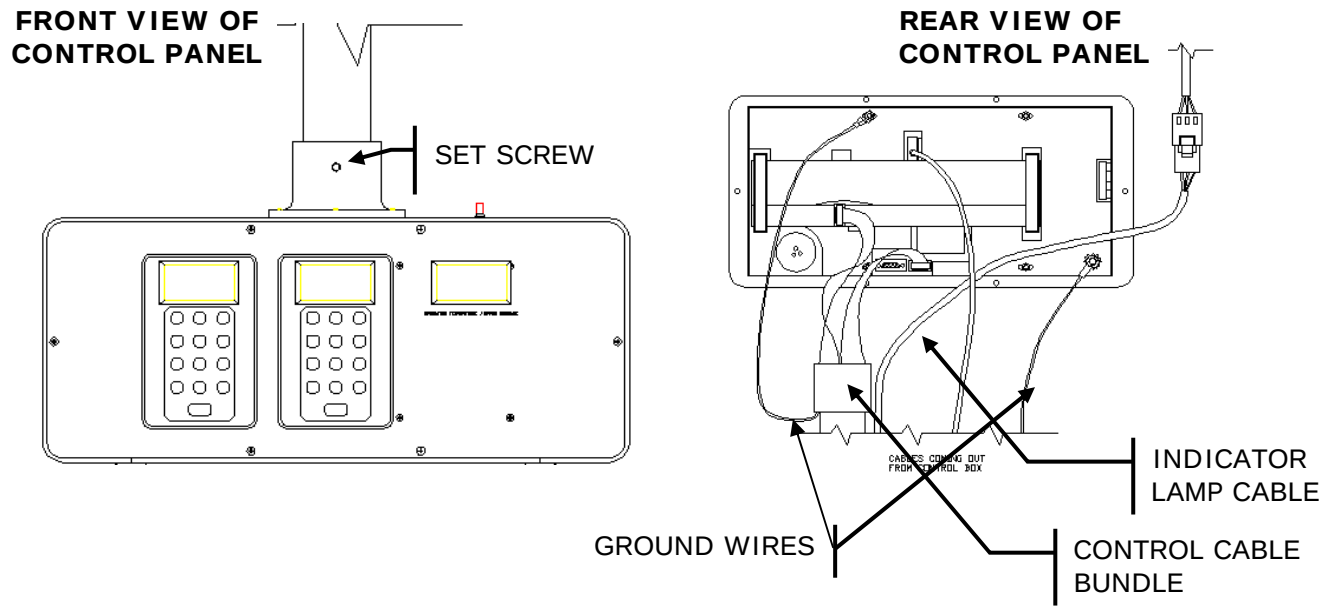


Connecting all the Wires

Now that the control arm and control panel housing are in place, the temperature probe wiring, control cable bundle, ground wire and photo sensor cable can be connected.

1. Remove the screws holding the control panel in place in the control panel housing (Figure 3-5).
2. Gently pry the control panel away from the control panel housing and lay upside down in the control panel housing.
3. Connect the wires to the back of the control panel (Figure 3-5) making sure that all ribbon connectors and cables are pressed firmly in place.
4. Replace the control panel back in the housing and tighten the screws in place (Figure 3-5).
5. At the rear of the freezer under the control arm support, remove the screws holding the wiring cover in place, remove the cover and connect the wiring (Figures 3-3, 3-4) making sure all ribbon connectors and cables are pressed firmly in place.
6. Replace the wiring protective cover using the screws and tighten the screws in place.

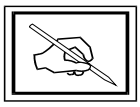
Figure 3-5: *Control Panel Wiring Detail*



Adding the InstaCoolant IV to the Freezer

The MP1100 uses 75 gallons of InstaCoolant IV silicone based coolant. The coolant is added to the freezer in a 53-gallon (200.6-liter) drum and small 4.5-gallon (9.5-liter) containers using the following method:

1. Remove a pocket in the left hand chamber closest to the left side of the chamber.
2. Insert the hose from the transfer pump through the pocket opening.
3. Add the coolant to the freezer until the level is about 2.5" (6.35 cm) above the bottom of each chamber.



NOTE: When coolant is added, wait two minutes before checking coolant level in each chamber.

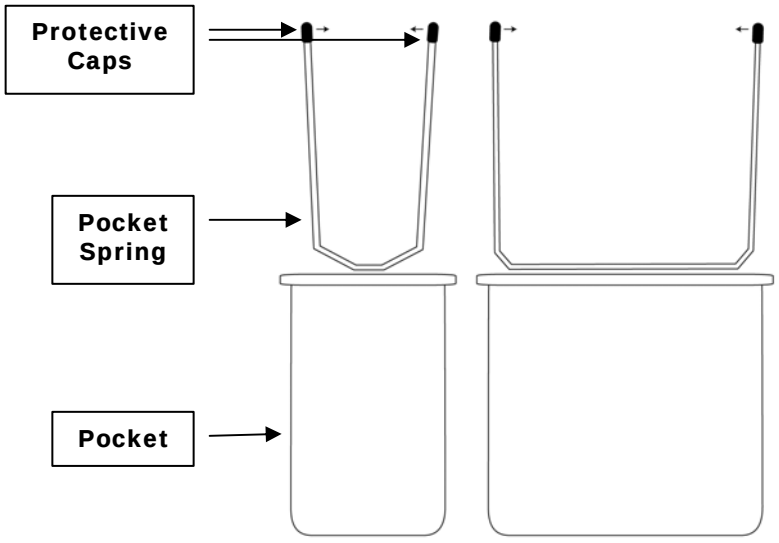
CAUTION: InstaCoolant IV should be stored in a room where the temperature does not exceed 85°F (29.4°C). Never store InstaCoolant IV in direct sunlight.

Removing and Replacing a Pocket — *P/N's 8-1100-20/21/23 and 8-1101-20/21/23*

Removing a pocket

1. Remove the pocket spring by reaching in the pocket and grasping the ends and pressing them slightly together as the spring is removed (Figure 3-6).

Figure 3-6: *Pocket Springs*



2. Grab the inside front seam of the pocket approximately one inch (2.5 cm) below the snap seal ring.
3. Lift up to pop the snap seal ring loose from the deck lip.
4. Remove the pocket.

Replacing a pocket

1. Holding the top of the pocket, push the new pocket through the opening in the deck.
2. Seams of the pocket should always be aligned toward the front and rear of the freezer.
3. Place the snap seal ring onto the deck lip.
4. Press the snap seal ring into place on the deck lip. Starting at the front seam, work around both sides of the snap ring, going toward the opposite side.
5. If using pocket springs, remember to replace them. Make sure the pocket spring is firmly in place under the snap seal of the pocket, and the protective caps are on the ends of the spring (Figure 3-6).

CAUTION: The protective caps must remain on the ends of the spring when in use. Failure to do so will compromise the integrity of the pocket.

6. When the pocket spring is in place, the tips of the pocket spring should press against the ends of the pocket under the deck.
7. Close lid.

Removing and Replacing a Pocket — *P/N's 8-1100-27 and 8-1101-27*

Removing a pocket

Each pocket has two seams down the sides and a clip at the bottom. The clip holds the pocket to the rod at the bottom of the freezing chamber. The top of the pocket has a snap seal ring which is used to attach it to the deck.

1. Turn off the vacuum disable switch on the secondary power panel.
2. Grab the inside front seam of the pocket approximately one inch (2.5 cm) below the snap seal ring.
3. Lift up to pop the snap seal ring loose from the deck lip.
4. Holding the pocket, push the pocket down below the deck and reach into the chamber. Grab the clip at the bottom of the pocket and twist to detach it from the rod.

CAUTION: Use care when removing the pockets. Placing hands in coolant when coolant temperature is below freezing can cause frostbite.

5. Remove the pocket.

Replacing a pocket

1. Holding the top of the pocket, push the new pocket through the opening in the deck.
2. Attach the clip located on the bottom of the pocket to the rod located at the bottom of the chamber by twisting the clip until it locks onto the rod.
3. Bring the top of the pocket up through the opening in the deck, being careful not to twist the pocket. Seams of the pocket should always be aligned toward the front and rear of the freezer.
4. Place the snap seal ring onto the deck lip.
5. Press the snap seal ring into place on the deck lip. Starting at the side seam, work around both sides of the snap seal ring, going toward the opposite side.
6. Close lid and turn vacuum disable switch back on.

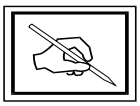
Adjusting the Safety Thermostat

The safety thermostat is a safety feature which is set at the factory to 80°F. Though InstaCoolant is usually stored at room temperature (75°F to 85°F (24°C to 29°C)). If the freezer detects a coolant temperature of greater than 80°F, the red indicator light would be illuminated and the safety thermostat would need to be temporarily adjusted. Call Helmer Technical Service for assistance with adjusting the safety thermostat.

CAUTION: Only a trained service technician should adjust the safety thermostat.

Starting the MP1100 Freezer

1. Make sure the unit is properly connected to power supply, then turn on the power switch.



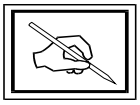
NOTE: There is a built-in 2 to 5 minute time delay once the power is turned on before the high-stage compressor turns on, along with the condenser cooling fans. Thirty seconds after the high stage compressor starts, the low stage compressor will start.

2. After the MicroCascade™ refrigeration system starts, the MP1100 Freezer will begin to chill the InstaCoolant to the set operating temperature.

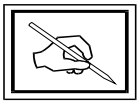
Temperature Pull-down

At the start of the temperature pull-down it is recommended to do the following:

1. Record the temperature on the display at the beginning of the pull-down.



NOTE: Record the temperature approximately every 10 minutes as the unit drops in temperature, to verify proper operation.



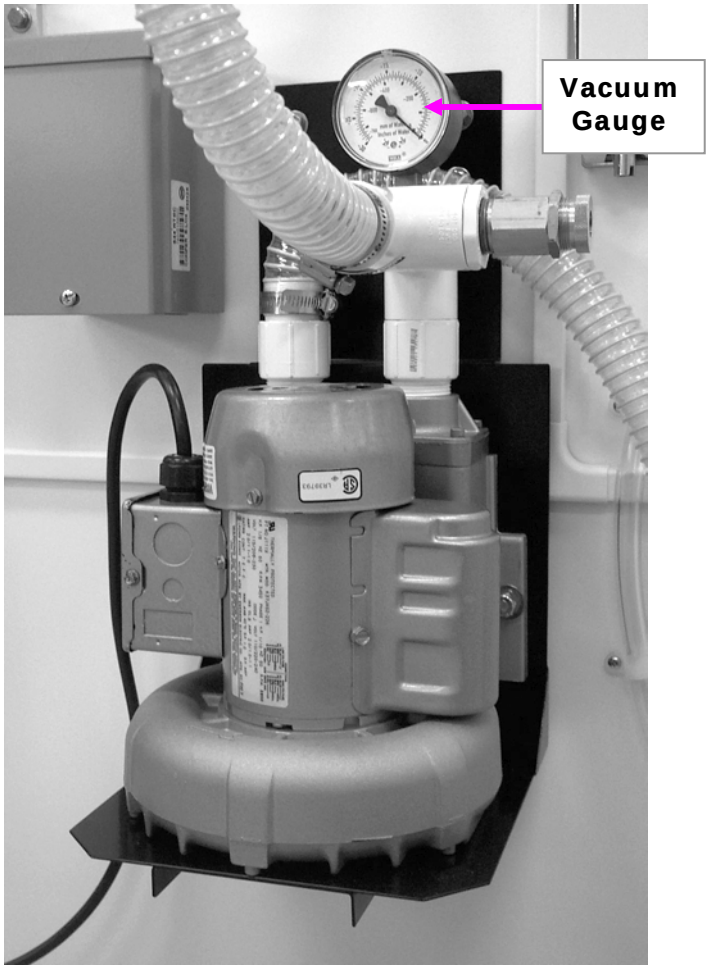
NOTE: During temperature pull-down it is necessary to run all chambers in continuous 90-minute freeze cycles to circulate the coolant.

Initiate a freeze cycle by doing the following:

1. Set a 90-minute freeze cycle in both chambers.
2. On each keypad press RESET.
3. Then enter "9000".
4. Press START within 10 seconds to confirm the selection
5. Check to make sure the display reads "9000" for a 90-Minute freeze cycle.
6. Begin a freeze cycle by pressing START again.
7. Then control panel will show "FILL" and the after 1-minute the timer will start to count down in seconds.
8. By running a freeze cycle during the temperature pull-down the coolant is continuously circulated resulting in a faster pull-down.
9. Run subsequent freeze cycles until the unit has reached operating temperature. Once the unit has reached operating temperature and the MicroCasade™ Condensing Unit has turned off, terminate the freeze cycle by pressing STOP/CLEAR.
10. The control panel will show "DRN" (for drain) for 1-minute. Then at the end of the drain cycle, the display will show "INT", press STOP/CLEAR again to reset the display for the next freeze cycle.

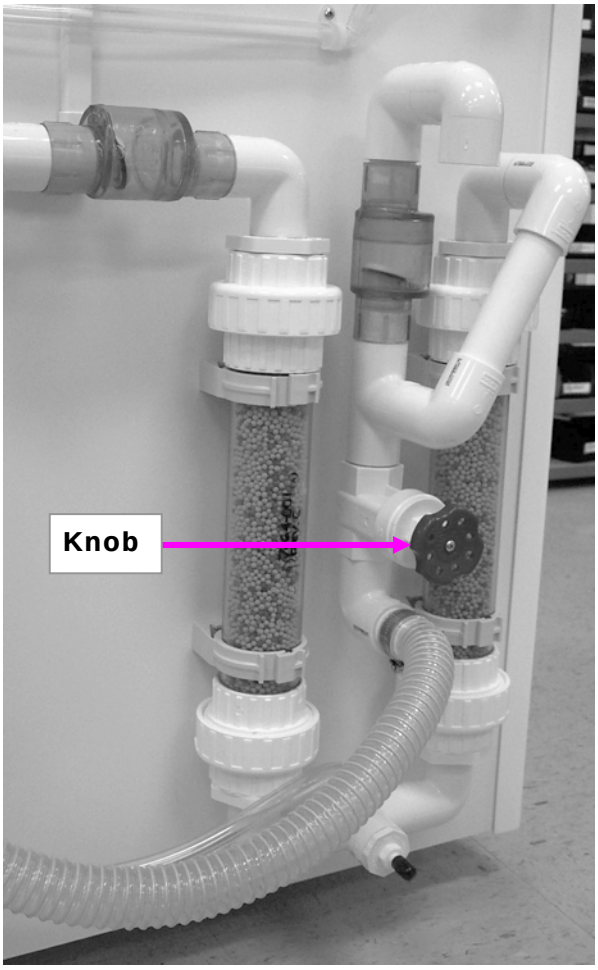
11. *(For P/N's 8-1100-27 and 8-1101-27 only)* Open lid and check vacuum system gauge on the back of the freezer (Figure 3-7).

Figure 3-7: *Vacuum system gauge*



The required operational vacuum range is 10-12 inches vacuum. If the vacuum gauge reading is more or less than 10-12 inches vacuum, the vacuum system needs adjustment. To increase vacuum, turn the red knob between the desiccant tubes counterclockwise. To decrease vacuum, turn the red knob clockwise (Figure 3-8).

Figure 3-8:
Desiccant Tube Assembly



Verifying Operating Temperature

After the freezer has reached the operating temperature, verify the temperature by following the steps listed in Section *Verification of Operating Temperature* – Chapter 4. After this verification, the MP1100 is now ready for validation and operation.

Chapter 4
Operating Instructions

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Introduction

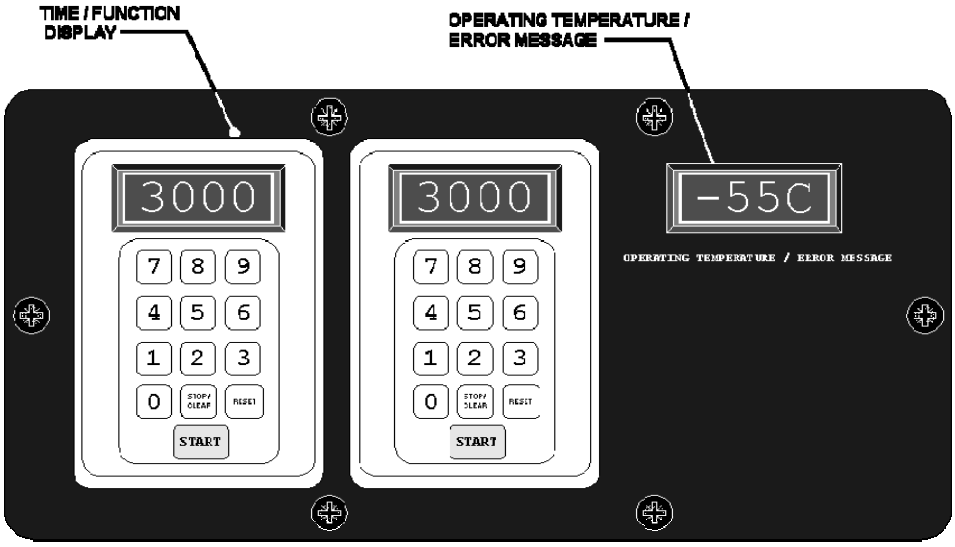
NOTE: In order to maintain a consistent temperature when the condensing unit is on, the pump motor will start filling and circulating coolant in the left chamber until set operating temperature is reached. To remove or insert product during this process, start a cycle in the right chamber.

This chapter outlines the following operations of the freezer using the Control Panel Keypads (Figure 4-1):

The MP1100 Freezer is easy to adjust and to operate. This section outlines the following basic operations of the freezer using the control panel keypads.

- Setting the operating temperature
- Verifying the operating temperature calibration
- Calibrating the operating temperature
- Setting the freeze cycle time
- Running a freeze cycle
- Running a defrost cycle
- Setting the MP1100 freezer for Night Cycle operation

Figure 4-1: *MP1100 Control Panel*

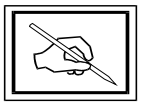


Factors Influencing Plasma Freeze Times

There are a number of variables which could influence the time it takes to freeze plasma in the MP1100. As additional variables are added to the freeze process, the time to freeze plasma solid may be extended.

Known factors which influence freeze time:

- Higher volume of plasma in the bag
- Greater number of bags per freeze cycle
- Larger size of the collection bag
- Folding plasma bags during freeze
- Use of overwrap bags during freeze
- Use of transport boxes during freeze
- Attached satellite bags during freezing
- Orientation of plasma bag in the pocket that allows part of the bag to be above the coolant level
- Lower coolant temperature
- Ambient operating temperature



NOTE: Please take into account the above variables when determining your freeze cycle time.

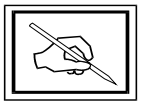
Operational Input Codes

The following codes are programmed to perform various functions with the freezers. Enter the codes using the keypad on the control panel. Codes are entered using the following sequence:

[CODE] → RESET → [DESIRED FUNCTION] → START

For example, to set the operating temperature to -42°C, the operator would enter “100”, press RESET, enter “42” (for -42°C) and press START within 10 seconds to save the instructions.

For example, to set the freeze cycle time, press RESET. The time/function display will flash the current freeze cycle time (i.e. – “1230” for 12 minutes, 30 seconds). Enter the desired freeze cycle time and press START to save the new cycle time.



NOTE: Press START within 10 seconds to save instructions; otherwise, the MP1100 will default to the previous setting.

CODE	FUNCTION
100	Set operating temperature
200	Set calibrated operating temperature
300	Nite cycle operation
400	Defrost cycle
RESET	Set or reset freeze cycle time
START	Begins freeze cycle and/or loads commands to memory
STOP/CLEAR	Interrupts or cancels a function

Setting the Operating Temperature

The operating temperature is the set temperature of the InstaCoolant IV during normal freezer operation. During a freeze cycle, the coolant temperature may rise a few degrees for a period of time as it absorbs the heat from the blood product. The MP1100 Freezer software allows the user to set the operating temperature from -25°C to -55°C.

The following steps will guide you through adjusting the operating temperature to the desired setpoint:

1. Enter **100** on a numeric keypad.
2. Press the RESET key.
3. The current operating temperature setting will flash on the operating temperature display.
4. Enter the desired operating temperature on the keypad. For example, enter **42** to set the operating temperature to -42°C. The new temperature is displayed on the keypad. The temperature range to be entered must be between -25°C and -55°C.
    a) To erase any entry, press the RESET key.
    b) To exit without saving, press the STOP/CLEAR key.
5. To save the new setting, press the START key within 10 seconds of the entry.
6. The coolant operating temperature is now set.

The coolant operating temperature is now set. To change the setpoint for the coolant operating temperature at any time, repeat steps 1 through 5 above.

Verifying Operating Temperature Calibration

Verifying the operating temperature of the freezer confirms that the digital temperature display is reading the actual coolant temperature around the pocket. ThermoGenesis Corp. calibrates the operating temperature of the freezer at the factory before shipment. Verification (and re-calibration if required) should be performed in the following instances:

- quarterly maintenance
- after relocation of the freezer
- if freezer has been turned off for a period of time.

To verify the temperature calibration:

1. The temperature of a freeze cycle must be measured.
2. Lift the lid on a chamber. The display will display "LID" / "OPEN".
3. Insert a calibrated thermometer (capable of reading to -60°C) into a middle pocket of the chamber corresponding to the keypad being used.
4. Close the lid.
5. Enter 300 reset on the corresponding keypad to initiate the freeze cycle. The chamber will fill and "NITE" will flash on the display.
6. After four minutes lift the lid. Keeping the thermometer close to the pocket, read and record the temperature. This will help to prevent false reading due to exposure to ambient temperature. Remove the thermometer from the pocket and close the lid. Press STOP on the keypad and the chamber will drain.
7. If the recorded temperature of the thermometer is not ±3°C from the temperature displayed on the control panel, the freezer operating temperature should be recalibrated (see below).

Recalibrating the Operating Temperature

1. To recalibrate the temperature, enter 200 on an idle keypad.
2. Press the RESET key.
3. The temperature display will flash "00".
4. On the keypad, enter the temperature obtained from the thermometer. The new temperature will be displayed. For example, if the calibrated thermometer reading was -35ºC and the display showed -42ºC, enter 35 to set the operating temperature to the calibrated temperature.
    a) To exit without saving, press the STOP/CLEAR key.

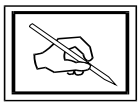
b) To erase any entry and start over, press the RESET key.

5. Press the START key **within 10 seconds** to save the new setting. The new setting will flash on the display panel for 10 seconds.
6. The operating temperature is calibrated. To recalibrate the operating temperature at anytime repeat the steps above.

Setting the Freeze Cycle Time

The freeze cycle time can be adjusted from 1 second to 99 minutes and 59 seconds, depending upon the user's requirements. It is important to follow the validation requirements set by your company to determine the freeze time required to produce the desired final core temperature of the product.

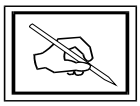
Perform the following steps to set the freeze cycle time:



NOTE: Setting the time on one keypad does not affect the setting on the other keypad.

1. Press the RESET key on the keypad corresponding to the freezing chamber being used. The chamber must be idle and the lid closed.
2. The current cycle time will flash on the display. The default is 90 minutes.
3. Enter the desired cycle time on the keypad. The new time is displayed (non-flashing) on the display. For example, enter **3000** to set the time to 30 minutes and 00 seconds. The maximum time that can be entered is 99 minutes and 59 seconds.
    a) To erase an entry and start over, press the RESET key.
    b) To exit without saving, press the STOP/CLEAR key.
4. Press the START key within 10 seconds to save the new setting. The new setting will be displayed.
5. The new freeze cycle time is now set. To change the freeze cycle time for another chamber, repeat the steps listed above on the appropriate keypad. Each chamber can have different freeze cycle times depending on customer requirements.

Running the Freeze Cycle



NOTE: Load right freezing chamber first and begin freeze cycle before loading product into left chamber and starting a freeze cycle in the left chamber.

Perform the following steps to run a freeze cycle on the MP1100:

1. Open a lid. The corresponding display will alternate between "LID" and "OPEN".
2. Place blood components in the pockets.

CAUTION: To prevent pocket damage, do not drop or force blood components in the pockets. If the unit has a vacuum system, wait until the vacuum light is ON before loading or unloading the unit with blood components.

3. Close the lid and press START. The control panel will flash "FILL" for one minute, indicating that coolant is filling the chamber.
4. Once the chamber is full, the corresponding display will begin a countdown.

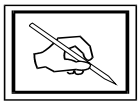
CAUTION: Unless absolutely necessary, do not raise the lid during the freeze cycle. Do not add blood components at any time during the freeze cycle without restarting the freeze cycle from the beginning, as this will result in those blood components being incompletely frozen.

5. If the lid is opened during the countdown, the chamber will drain, the display will flash "DRN ▼", and then a 5-second alarm will sound. After the lid is closed, the chamber will fill, the display will flash "FILL", and then the freeze cycle will resume at the point before the lid was opened.
6. During the freeze cycle, the countdown is displayed on the control panel.
    a) To stop the cycle, press STOP/CLEAR. The chamber will drain, the display will flash "DRN ▼", an alarm will sound and "INT" will flash on the control panel.
    b) Press STOP/CLEAR again to restart freezing cycle or press START and freezer will resume at the point that the cycle was interrupted.

7. The freeze cycle is complete when the countdown on the Time/Function Display reaches "0". The control panel will display "DRN ▼".
8. When the 75-second drain cycle is completed, an alarm will sound.
9. Lift the lid. While the lid is open, the display will alternate between "LID" and "OPEN".
10. Remove the frozen blood components from the pockets.

CAUTION: To reduce the possibility of damaging the pockets, slowly remove product from pockets.

Running the Night Cycle



NOTE: ThermoGenesis Corp. recommends running the MP1100 in night cycle mode if unit is not being used for more than a 24-hour period, such as weekends or holidays. The night cycle prevents temperature variances when the unit is not being used to freeze blood components.

The night cycle operation allows the user to place a load of blood components in a chamber (or all chambers) before leaving for the night or a weekend. When the night cycle is activated, the unit performs a normal freeze cycle for the length of time last set on the control panel. Upon completion of the freeze cycle, the freezer will then cycle the pumps for five minutes every half-hour to maintain the temperature of the frozen blood components.

Perform the following steps to run a night cycle:

1. Open the lid to an idle chamber and place the blood components in the pockets. The corresponding keypad will alternate between "LID" and "OPEN".
2. Close the lid. The display will change back to the cycle time.
3. Enter 300 on keypad corresponding to the chamber where the blood components have been loaded.
4. Press RESET. The corresponding display will flash "NITE".
5. The night cycle is in operation. While the pumps are running, the display will flash "NITE" and when the pumps are not running, "NITE" will not flash.
6. The user can return to normal operating mode by simply pressing the STOP/CLEAR button on the keypad.
7. To run a night cycle in more than one chamber, repeat these steps on each keypad corresponding to the chamber being used.

Chapter 5
Maintenance

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The following are the minimum recommended maintenance periods. Maintenance may be performed more frequently if required. Forms are included in Appendix A of this Manual. The table below outlines the maintenance schedules to be performed by the blood center. The sections following the table provide detail for the routine maintenance schedules listed.

Maintenance Schedule

SCHEDULE	MAINTENANCE DESCRIPTION
Daily	• Clean the deck • Check and clean or repair the pockets *(repair or replace if necessary)*
Weekly	• Clean the unit
Monthly	• Check desiccant filters • Check motor box cooling fans • Check vacuum gauge *(P/N's 8-1100-27 and 8-1101-27)*
Quarterly	• Check coolant level • Check lid gasket seals • Check hinges • Check deck screws • Verify operating temperature calibration • Defrost the freezer
Bi-annual	• Maintain the refrigeration system

Checking and Cleaning Pockets

NOTE: If there is a blood component leak, dispose of biohazardous waste in a biohazardous waste container in accordance with local and national regulations.

1. *(For P/N's 8-1100-27 and 8-1101-27)* Before using the vacuum gauge, the vacuum light needs to be illuminated. If the light is not working, see Section *Troubleshooting* – Chapter 6. Check the pockets for leaks using the vacuum test gauge provided with the freezer. Insert foam part of test gauge into each pocket. If the gauge registers any value greater than 0, the pocket has a leak and needs to be repaired or replaced. If not immediately replaced, a pocket plug can be inserted into the pocket opening temporarily.

CAUTION: Do not vacuum out the coolant.

2. If coolant is inside the pocket, it also indicates a leak. Repair or replace the pocket.
3. If ice or frost is inside the pocket, remove the ice or frost with a small, wet/dry vacuum cleaner.
4. Dry the lids and deck with a soft cloth and close the lids.

Cleaning the Deck

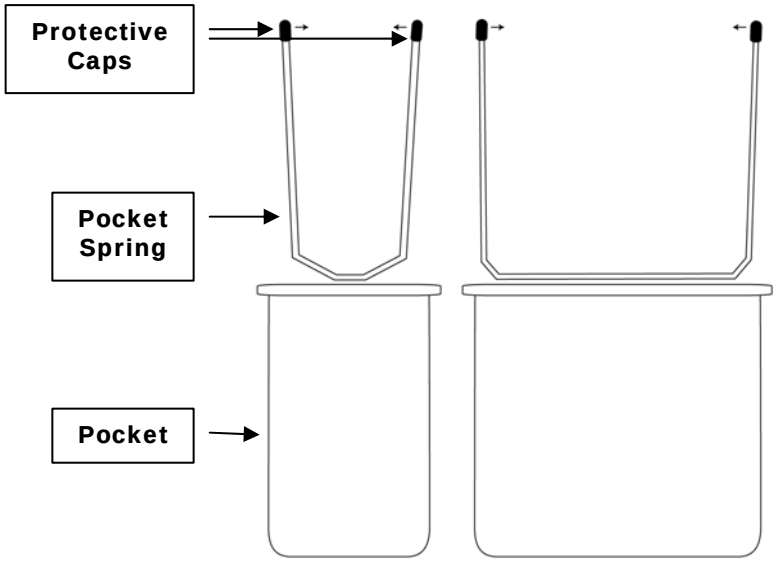
1. Raise both lids allowing ice to melt off the deck (approximately 15-20 minutes).
2. Once ice is melted, use a wet/dry vacuum cleaner or soft cloth to remove water from the deck and around the pockets.

Removing and Replacing a Pocket — *P/N's 8-1100-20/21/23 and 8-1101-20/21/23*

Removing a pocket

Remove the pocket spring by reaching in the pocket and grasping the ends and pressing them slightly together as the spring is removed (Figure 5-1).

Figure 5-1: *Pocket springs*



1. Grab the inside front seam of the pocket approximately 1 inch (2.5 cm) below the snap seal ring.

2. Lift up to pop the snap seal ring loose from the deck lip.
3. Remove the pocket.

Replacing a pocket

1. Holding the top of the pocket, push the new pocket through the opening in the deck.
2. Seams of the pocket should always be aligned toward the front and rear of the freezer.
3. Place the snap seal ring onto the deck lip.
4. Press the snap seal ring into place on the deck lip. Starting at the front seam, work around both sides of the snap ring, going toward the opposite side.
5. Replace pocket springs and ensure that black protective caps are firmly seated on spring before placing into pockets (Figure 5-1).
6. Close lid.

Removing and Replacing a Pocket — *P/N's 8-1100-27 and 8-1101-27*

Removing a pocket

Each pocket has two seams down the sides and a clip at the bottom. The clip holds the pocket to the rod at the bottom of the freezing chamber. The top of the pocket has a snap seal ring which is used to attach it to the deck.

1. Turn off the vacuum disable switch on the secondary power panel.
2. Grab the inside front seam of the pocket approximately 1 inch (2.5 cm) below the snap seal ring.
3. Lift up to pop the snap seal ring loose from the deck lip.
4. Holding the pocket, push the pocket down below the deck and reach into the chamber. Grab the clip at the bottom of the pocket and twist to detach it from the rod.

CAUTION: Use care when removing the pockets. Placing hands in coolant when coolant temperature is below freezing can cause frostbite.

5. Remove the pocket.

Replacing a pocket *(models 8-1100/1101-27)*:

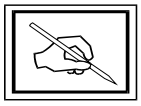
1. Holding the top of the pocket, push the new pocket through the opening in the deck.
2. Attach the clip located on the bottom of the pocket to the rod located at the bottom of the chamber by twisting the clip until it locks onto the rod.

3. Bring the top of the pocket up through the opening in the deck, being careful not to twist the pocket. Seams of the pocket should always be aligned toward the front and rear of the freezer.
4. Place the snap seal ring onto the deck lip.
5. Press the snap seal ring into place on the deck lip. Starting at the side seam, work around both sides of the snap seal ring, going toward the opposite side.
6. Close lid and turn vacuum disable switch back on.

Repairing a Pocket

CAUTION: Wear protective gloves and use safety precautions. If repairing pocket during a decontamination procedure, follow biohazardous precautions.

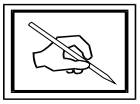
1. Use the pocket repair kit that comes with the freezer (See Section *Unpacking and Inspection* – Chapter 3), a cotton swab and a disposable cup.
2. Remove the leaking pocket (see previous Section *Removing and Replacing a Pocket*). Use soft cloth to remove coolant from pocket.
3. Locate the hole visually or by filling the pocket with water and watching for leaks.



NOTE: The pocket repair kit is designed for repair of small holes, not for tears along the seam or around the snap seal ring.

4. Make sure the surface of the pocket to be patched is dry. Place a small amount of repair kit tape on the inside of the pocket covering the hole.
5. Clean 1 cm around the hole by applying a small amount of Cotol-240 with the cotton swab to the outside of the pocket.
6. In the disposable cup, mix equal amounts of Cotol-240 and Aquaseal using the wooden stir stick. The consistency should be like liquid glue.
7. Apply a coating of this mixture onto the hole overlapping 1 cm around the hole.
8. Let dry for a full 2 hours. Test the repaired pocket for leaks by following step 3. If there is no leak, then pocket is ready to use. If there is a leak, repeat the repair procedure (steps 4 through 8). Re-test for leaks before use.

9. A repaired pocket should be used as an interim solution. A repaired pocket should be replaced with a new pocket.



NOTE: Place the opened container of Aquaseal in the refrigerator for later pocket repairs. Once mixed, Cotol-240 and Aquaseal can be used until the glue becomes thick.

Cleaning the Freezer

On a weekly basis, clean the freezer. Using a mild detergent in warm water, wipe all outer surfaces, the control panel, the inner surfaces of the lid and gasket and the deck.

Checking Desiccant Filters

The desiccant filter tube(s) are located on the back of the freezer (Figures 3-1, 3-2). The blue indicating pellets in the desiccant material need to be replaced when all the blue pellets fade to a gray color.

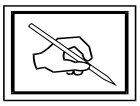
To replace desiccant material:

1. Unsnap the clips holding the tube and remove the tube of desiccant.
2. Remove the top coupling on the desiccant filter that holds the desiccant beads.
3. Dispose of contents according to local regulations.
4. Fill clear tubes completely with new desiccant (P/N 7-01-038).
5. Replace top coupling and tighten.
6. Place the tube back into the clamps and snap closed.
7. Repeat for the other desiccant tube *(P/N's 8-1100-27 and 8-1101-27)*.
8. Verify proper tubing connection or inlet and outlet of tubes.

Checking the Pump Motor Cooling Fans

1. Hold a piece of paper against the intake fans on the right side of the motor box cover. The paper should be drawn into the fans indicating a good airflow.
2. Hold a piece of paper against the exhaust fans at the back of the motor box cover. The paper should be blown away from the cover.
3. If there is no airflow, turn the freezer off immediately and contact Helmer Technical Service.

Checking the Coolant Level

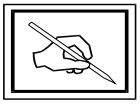


NOTE: Coolant level should only be checked with freezer at operating temperature with none of the chambers running.

1. No chambers should be in use and it should be at least 5 minutes from the last freeze cycle.
2. Open a lid and remove one of the front pockets.
3. Look down into the chamber. The coolant level should be about 2.5" (63.5 mm) above the bottom of the chamber. Use a ruler or other measuring device to check the level.
4. Add coolant if level is less than 2.5" (63.5 mm). Pour coolant into the chamber through the removed pocket opening using a funnel until coolant level is at 2.5" (63.5 mm).
5. Replace the pocket and close the lid.

Checking the Lid Gasket Seals

1. All lids should be closed.
2. Visually inspect to make sure there are no gaps between the lid and the gasket and the deck.
3. If a gap is found, then check hinges on the appropriate lid to make sure the hinge is not loose. If hinge is loose, adjust hinge until seal is restored. If hinge is not loose, replace the gasket seal.



NOTE: A tight seal reduces water from entering into the unit, reducing ice build-up on deck and in coolant.

Checking the Hinges

1. Open the lids. Lids should remain open.
2. Visually inspect the hinges for damage. Grasp either side of the hinge and gently move hinge side-to-side and up-and-down. If hinges are loose, they will move during this test. If hinges are loose, re-seat lid (if necessary) and tighten appropriate hinge screws. Repeat test until no hinge movement is detected.
3. Close lids and inspect them to make sure there is no gap between the lid and gasket.

Checking the Deck Screws

1. Open both lids.
2. Inspect the deck to ensure that all screws are tight. Tighten the screws if needed.

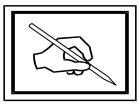
Verifying the Operating Temperature Calibration

See Section *Verifying Operating Temperature* – Chapter 4.

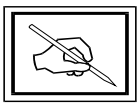
The Defrost Cycle

Factors that may influence the need for defrost are:

- Operation of the freezer in a high humidity environment
- Improperly sealed pockets. When this happens, moisture in the air condenses and turns to ice. Ice buildup in the reservoir will eventually clog the pump inlets and cause improper filling, resulting in unfrozen product. Ice buildup can also cause pump breakage and costly repairs.



NOTE: THERMOGENESIS CORP. recommends, as a minimum, defrosting the freezer every 90 days. If humidity in the room where the freezer is located is higher than the specified humidity range or the freezer pockets have not been properly maintained, the freezer may require more frequent defrost and filter cycles.



NOTE: The MP1100 is equipped with an electric defrost heater to aid in warming up the coolant.

The following steps will guide the user through the defrost cycle procedure.

Before Starting the Defrost Cycle

There are two items to verify before starting a defrost cycle. Non compliance of either of these may cause the sensing bulb of the safety thermostat to be exposed above the coolant and cause the termination of the defrost cycle. As a result of the termination of the cycle, the control panel will go black. The system will automatically return to the refrigeration cycle (the control panel will reinitiate just as though the user had turned off, then turned

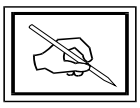
on, the freezer). The unit will start to pull-down to set operating temperature.

1. It is important to make sure that the freezer is level, both front-to-back, and side-to-side.
2. The coolant level in each chamber should be about 2.5" (63.5 mm) above the bottom of the chamber when the unit is at rest. There must be sufficient coolant in the freezer.

WARNING–FIRE DANGER: DO NOT place an electric immersion heater in the coolant. (see Section *Safety Precautions* – Chapter 1).

Initiating the Defrost Cycle

1. Loosen a pocket and place 4 to 6 drops of dye (located in the Accessories Kit) in either chamber.
2. To start the defrost cycle, enter **400** on one of the numeric keypads, then press RESET. This closes the refrigerant liquid line solenoid valve, shutting off refrigeration to the freezer. At the same time, the pumps begin circulating the coolant through the chambers, and the defrost heater is engaged to warm up the coolant to 3ºC–5ºC (37ºF–41ºF). The MP1100 Freezer will take 6–10 hours (depending on operating temperature) to warm the coolant to termination temperature.
3. Once the defrost warm-up cycle completes and shuts off the pumps, allow the unit to sit for about 5 minutes (this will allow the water in the system to settle) turn the power switch on the freezer to the OFF position.
4. *For P/N's 8-1100-27 and 8-1101-27*, before the defrost cycle completes the warming of the coolant (to about +2°C), remove the pockets from the front and back of each chamber. (*For P/N's 8-1100-20/21/23 and 8-1101-20/21/23*), simply open the lip of the pocket.



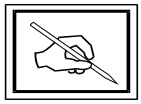
NOTE: Since the pumps are still running, they will circulate the dye throughout the reservoir and the chamber(s) allowing any water in the freezer to absorb the coloring.

5. While still facing the primary power panel, remove the 4 screws holding the primary power panel in place and gently slide the primary power panel out of the console.
6. Remove the solenoid fuse from the fuse holder marked SOLENOID or the wire connector next to the fuse holder marked solenoid coil.

7. Replace the primary power panel in the console and secure with the four screws.

Draining the Water from the System

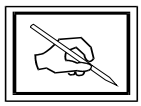
1. Make sure that pockets at the front and back of the chambers are removed to allow access to the bottom of the chambers for removal of any water collected there.
2. Make sure that you have a 5-gallon pail and the hand pump (located in the Accessories Kit).
3. Take the hand pump and carefully skim any colored water residing on top of the coolant which is in the bottom of each chamber.
4. Once the chambers are cleared of any collected water, turn the power switch to the ON position, start the pumps again, and run for a period of 15 minutes. This will deposit more water into the chambers.
5. After shutting off the pumps, allow the unit to sit for a period of 5 minutes to allow the water to settle in the chambers.
6. Repeat Steps 1 through 4 until no colored water is seen in the chambers. Then turn the Freezer Power switch to the OFF position.
7. Remove the small black port cover on the drain port of the freezer (located on left hand side of freezer in upper right hand corner). Attach the hand pump to the drain port.
8. Pump fluid until it becomes clear, then run pump for 15 minutes. Allow fluid to sit 5 minutes, then pump again. If no colored water comes out, then the water has been drained. If not, then repeat this process again.
9. Remove the hand pump from the drain port and replace the small black port cover on the drain port.
10. Allow the fluid in the 5-gallon pail to settle for about 5 minutes. Place the pail into a walk-in freezer. In approximately one hour, the water will freeze, but the coolant will not freeze. This will separate the water from any coolant in the pail. Properly dispose of the colored water. Pour the remaining coolant into the unit (see previous Section *Checking the Coolant Level*). Store the hand pump to prevent damage or loss; you will need the hand pump for future use in defrost cycles.



NOTE: Freeze pail overnight. Remove ice and pour coolant back into the freezer.

Restoring Freezer to Operating Temperature

1. Replace all pockets removed in the defrost process to their proper positions, making sure the snap-seals are firmly in place. Also, check all the pockets for tears or holes.



NOTE: Remember that improperly sealed, or torn pockets allow moisture to enter the freezer chamber. This moisture enters the system quickly when the freezer is down to operating temperature contributing to ice build up and resulting in the need for more frequent defrost.

2. While facing the primary power panel, remove the 4 screws holding the primary power panel in place and gently slide the primary power panel out of the console.
3. Replace the solenoid fuse in the fuse holder marked SOLENOID and/or the wire connector and verify that the fuse holder is securely refastened.
4. Replace the primary power panel in the console and secure with the four screws.
5. The refrigeration will start and the system will begin to cool down to the set operating temperature (-25ºC to -55ºC or -32ºF to -67ºF). Remember, there is a programmed 2–5 minute delay after the defrost cycle is terminated, prior to the refrigeration system start up.
6. Set freeze cycle times on both keypads for 90 minutes and run continuous freeze cycles to circulate coolant until the unit is down to the set operating temperature.
7. After unit comes down to temperature, check the coolant level.
8. Verify operating temperature calibration and calibrate as needed (see Section *Calibrating the Operating Temperature* – Chapter 4).

Maintaining the Refrigeration System

1. Turn the power switch on the right side of the freezer to OFF.
2. Remove the screws holding the grille on the front of the condensing unit section of the freezer.
3. Remove the grille and carefully place it next to the freezer. The inlet side of the refrigeration condenser coil is now visible.
4. Using a soft vacuum brush, vacuum any dust and dirt off the fins of the condenser coil, being careful not to bend any of the fins on the coil. Then, vacuum the grille.

Chapter 6
Troubleshooting

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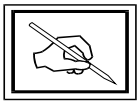
Introduction

The following chart outlines common problems that could occur and solutions to those problems. The chart indicates repair and/or replacement procedures to accommodate the solutions indicated.

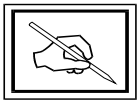
For further technical assistance, contact Helmer Technical Service:

14400 Bergen Boulevard
Noblesville, IN 46060
Tel: 800.743.5637 (U.S./Canada)
Direct: +1.317.773.9092 (non-U.S./Canada)
Fax: +1.317.773.9082
service@helmerinc.com

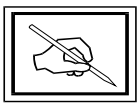
WARNING: Fuse replacement and troubleshooting the freezer's electrical system should only be performed by a qualified technician. Before servicing internal components of the MP1100, turn off all power to the freezer and unplug from the wall.



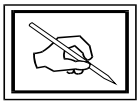
NOTE: During disassembly, keep all parts for later re-assembly.



NOTE: Check all hose and wiring connectors to make sure they are secure and correct.



NOTE: Special tools and service material may be required depending on the repair. Be sure to use these tools and materials and follow the proper work procedure.



NOTE: General ESD Control Practices should be utilized when servicing or repairing this equipment.

CAUTION: Make sure the InstaCoolant IV is above freezing (32°F (0°C)) before performing any service inside the machine. Placing your hands in the coolant when it is below freezing creates an extreme frostbite danger.

Problem	Probable Cause	Solution
No Power to Unit	Plug is not secured into the wall.	Secure plug into the wall. In the case of a twist lock plug, insert into wall and twist clockwise into position.
	Main power switch has been turned off.	Turn the main power switch on.
	Blown Fuse(s)	Remove primary power panel and replace fuse(s).
	Loose wires or snap connectors	Remove the motor box cover and check all wire connections and snap connectors to verify that they are secure.
	Coolant temperature is too high. Coolant temperature has exceeded the safety limit (26°C, 80°F) and the Safety Thermostat has shut off power to the freezer. If this is the case, the red light on the right side of the freezer will be on.	Turn off the main power switch and contact Helmer Technical Service.
Freezer display is lit, but pumps do not work.	Blown Fuse(s)	Remove primary power panel and replace fuse(s).
	Pump(s) is (are) iced up.	Defrost the freezer (See Section *Running the Defrost Cycle – Chapter 5*).
Coolant Chamber fills initially, but during the cycle, the coolant level drops off.	Freezer has accumulated ice that is clogging the pump inlet(s).	Defrost the freezer (See Section *Running the Defrost Cycle – Chapter 5*).
Product is not completely frozen.	Freezing chamber is not completely filling with coolant. Freezer has accumulated ice that is clogging the pump inlet.	Defrost the freezer (See Section *Running the Defrost Cycle – Chapter 5*).
	Coolant pump is not running.	See *Freezer display is lit, but pumps do not work*. Check fuses in primary power panel.

Problem	Probable Cause	Solution
Product is not completely frozen *(continued from previous page)*.	Pump coolant transfer hoses are loose on the connections or have broken.	Reconnect coolant hose to the fitting and tighten clamps, or replace coolant hose. **CAUTION:** Always warm coolant to at least 0°C before working around the coolant.
	The freeze cycle is out of adjustment.	Adjust the freeze cycle time, according to facility-validated procedures.
	The freezer is out of calibration.	See Section *Calibrating the Operating Temperature* – Chapter 4.
Coolant temperature is too high.	Condensing unit is not running.	Have a qualified refrigeration technician check the refrigeration system.
	Freezer is out of calibration.	Calibrate the temperature of the coolant.
	Coil has excessive ice build-up.	Defrost the freezer.
Condensing unit (refrigerant system) shuts down.	Maintenance on the condensing unit not done.	Have a qualified refrigeration technician check the refrigeration system.
	Blown solenoid fuse.	Check the fuses in the primary power panel.
	Room temperature is out of specification.	Turn off the main power switch and contact Helmer Technical Service for assistance.
Pockets tearing or ripping	Blood components are being dropped or forced into pockets.	Insert blood components smoothly into pockets. Bags containing frozen blood products have sharp edges. Pay careful attention when placing frozen product into pockets.
	Protective caps missing from pocket springs.	Verify protective caps are on the pocket spring. Replace if missing.
Vacuum light is not activating *(P/N's 8-1100-27 and 8-1101-27 only).*	The vacuum system is not working properly.	1. Check pockets for leaks. If leaking pockets are found, repair or replace leaking pockets (see Sections *Removing and Replacing a Pocket* and *Repairing a Pocket* – Chapter 5 *Maintenance*). 2. If no leaking pockets have been found, defrost freezer. 3. If vacuum system is still not working, have a qualified technician check the system. If vacuum system needs to be replaced, contact Helmer Technical Service.

Chapter 7
Parts Replacements for the MP1100 Freezer

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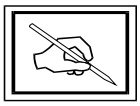
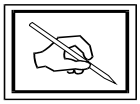
Safety Precautions

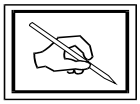


NOTE: During disassembly, keep parts in order to facilitate re-assembly.

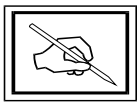
CAUTION: Prior to starting any electrical work, disconnect all power to the freezer.



NOTE: Check all hose and wiring connectors to make sure they are secure and correct.



NOTE: Special tools and service material may be required depending on the repair. Be sure to use these tools and materials and follow the proper work procedure.



NOTE: General ESD Control Practices should be utilized when servicing or repairing this equipment.

CAUTION: Make sure the InstaCoolant IV is above freezing before performing any service inside the machine. Placing your hands in the coolant when it is below freezing creates an extreme frostbite danger.

See next page

Hinge

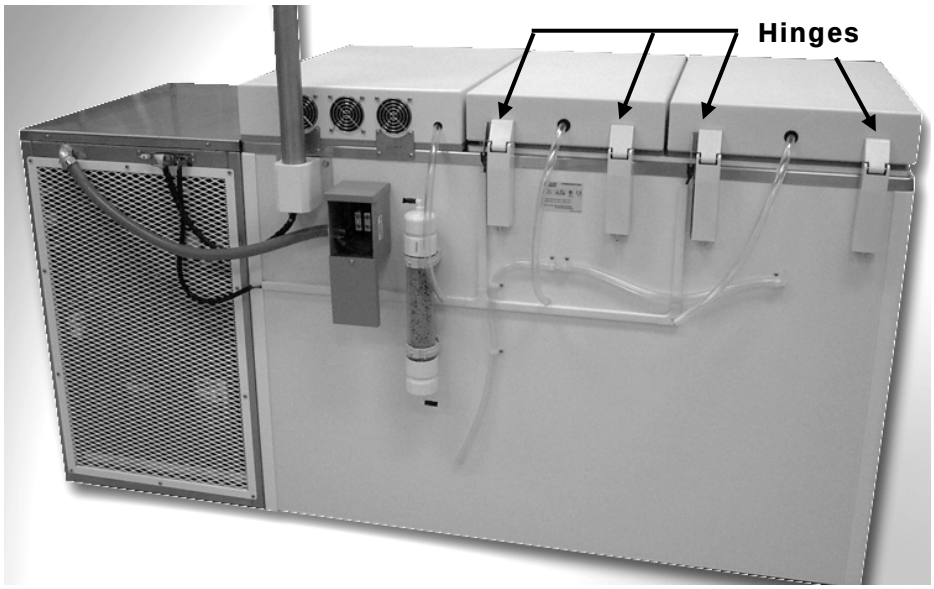
Tools Required

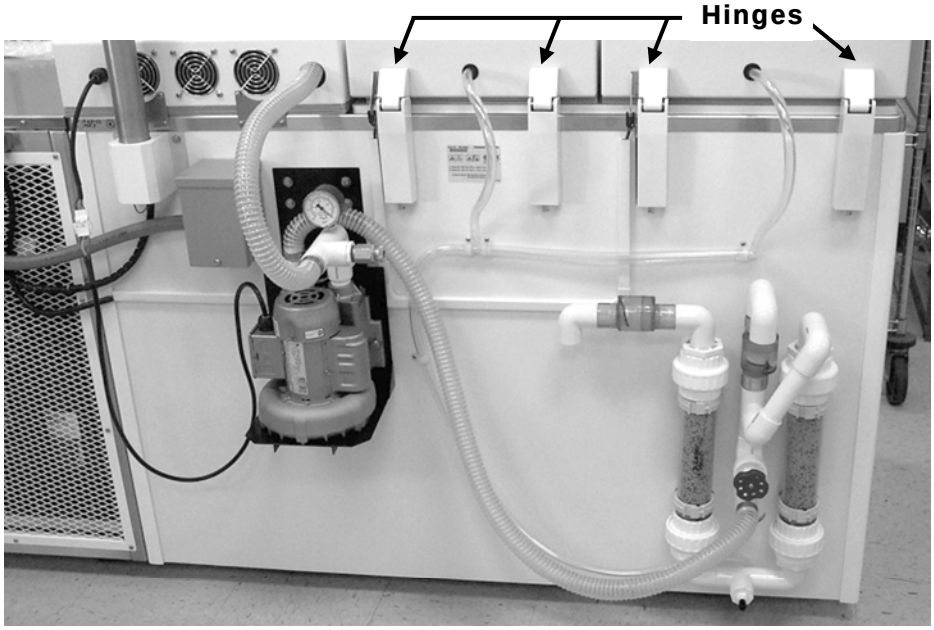
- T-Handle Allen wrench, 5/32”

Removal

1. Lift up upper and lower plastic hinge covers to expose mounting screws (Figures 7-1, 7-2).

Figures 7-1, 7-2: *Hinges*





2. Using the Allen wrench, remove the four screws and washers that secure the upper hinge body to the lid (Figure 7-3).

Figure 7-3: *Hinge Assembly*

3. Remove the two upper screws, washers and spacer that secure the lower-hinge body to the chassis (Figure 7-3).
4. Loosen the two lower screws that secure the lower-hinge body to the chassis (Figure 7-3).
5. Remove the hinge by pulling upward.

Installation

1. Position lower mounting slots of lower-hinge body so they engage between the freezer chassis and flat washers of the two loosened lower mounting screws.
2. Align upper mounting slots of lower-hinge body with chassis mounting holes and install the two upper-hinge mounting screws and washers.
3. Align lid-mounting holes with upper-hinge mounting holes and install the four remaining mounting screws and washers.
4. Check lid gasket-to-deck seal per *Maintenance* – Chapter 5.
5. Lower both upper and lower plastic hinge covers.

Lid

Tools and Supply Required

- T-Handle Allen wrench, 5/32”
- 3/8” rubber cap (or duct tape)

Removal

1. Remove (pull off) upper plastic hinge covers to expose hinge-to-lid mounting screws.
2. Using Allen wrench, remove the 16 screws (eight per hinge) and washers that secure upper hinge body to lid (Figures 7-1, 7-2).
3. Disconnect desiccant tube extending from rear of lid to filter assembly mounted on rear of freezer chassis (Figures 7-1, 7-2).
4. Cap off desiccant filter fitting (duct tape works well in place of a rubber cap).
5. Remove lid from deck.

Installation

1. Place lid on top of deck and align lid mounting holes with hinge mounting holes.
2. Install eight-each, hinge mounting screws and washers.
3. Check lid gasket-to-deck seal per *Maintenance* – Chapter 5.
4. Install upper plastic hinge covers.
5. Remove cap from desiccant filter fitting and connect desiccant tube extending from rear of lid to filter assembly.

Lid Gasket

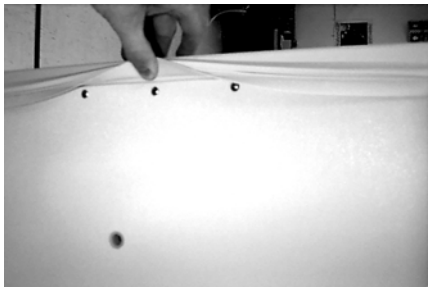
Tools Required

- #2 Phillips screwdriver
- Awl (for new gasket installation)

Removal

1. Remove lid per Section *Lid* and place on flat work area with gasket side up.
2. Starting on one side, lift inner flange of lid gasket toward outside edge of lid to expose mounting screws (Figure 7-4).

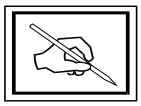
Figure 7-4: *Lid Gasket Removal*



3. Using the screwdriver, remove the exposed mounting screws.
4. Continue around the lid by lifting the gasket and removing exposed screws until all screws are removed.
5. Remove gasket by stretching flange over edge of mounting plate.

Installation

1. Position gasket on gasket plate and stretch over edge all around perimeter until gasket flange is fully seated between gasket plate and lid.
2. Starting on one side, lift inner flange of lid gasket toward outside edge of lid to expose gasket plate mounting holes.
3. Align one gasket plate mounting hole with corresponding gasket and lid mounting holes and install one mounting screw.



NOTE: If installing a new gasket, installer should use gasket plate as a template and transfer holes onto gasket using an awl before proceeding with this step.

4. Continue around the lid by lifting gasket, aligning mounting holes and installing mounting screws until all screws are secure.
5. Re-check each mounting screw to ensure tightness.
6. Re-install lid per Section *Lid*.

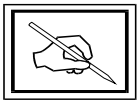
Lid Gasket Plate

Tools and Supplies Required

- #2 Phillips screwdriver
- Bostik 1100FS (P/N: 5-13-004)
- 4” cable tie

Removal

1. Remove lid gasket per Section *Lid Gasket*.
2. Separate gasket plate from lid by pulling up and away from lid.



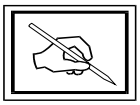
NOTE: Gasket plate is factory bonded to lid with a flexible sealant. Some force maybe required in breaking this bond. In some rare cases, older freezers for instance, the old gasket plate may be needed for a mounting hole template to transfer holes to new gasket plate. Therefore, it is recommended that care be taken to keep the old gasket plate intact during removal.

3. Disconnect desiccant tube from barbed elbow located on backside of plate by cutting cable tie that secures tube to elbow (Figure 7-5).

4. Remove threaded barbed elbow from plate and retain for installing on new gasket plate (Figure 7-5).

Installation

1. If new gasket plate does not have pre-drilled mounting holes, use old gasket as a template and transfer holes to new plate.
2. Cut away any loose or raised portions of old bonding sealant from lid surface.
3. Apply a continuous 5/32" line of silicone caulking all along the inside edge of the foam-to-plastic joint (Figure 7-6).
4. Install threaded barbed elbow (removed from old gasket plate) on backside of new plate until it is flush with textured surface.
5. Install desiccant tube onto barbed elbow.



NOTE: Some slight adjustment (tightening/loosening) of elbow may be necessary to align it with tube.

6. Secure tube to elbow with new cable tie (Figure 7-5).
7. Locate gasket onto new gasket plate and install plate to lid Section *Lid Gasket*.
8. Re-install lid per Section *Lid*.

Figure 7-5: *Installing Gasket Plate*

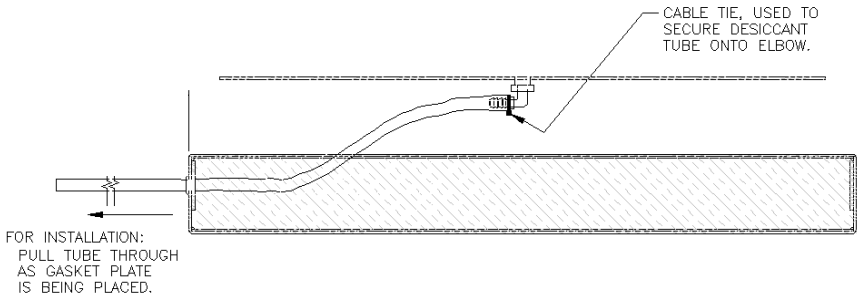

CABLE TIE, USED TO SECURE DESICCANT TUBE ONTO ELBOW.
FOR INSTALLATION: PULL TUBE THROUGH AS GASKET PLATE IS BEING PLACED.
REMOVING & INSTALLING LID GASKET PLATE

Figure 7-6: *Gasket Plate Sealant Application*

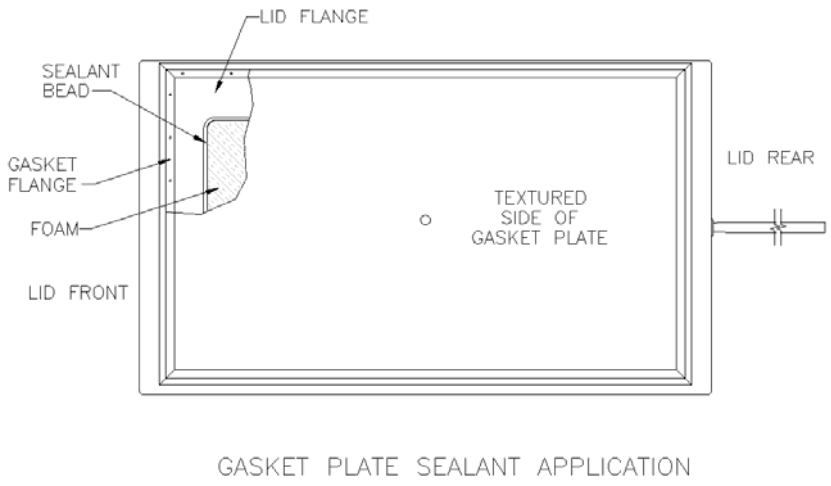
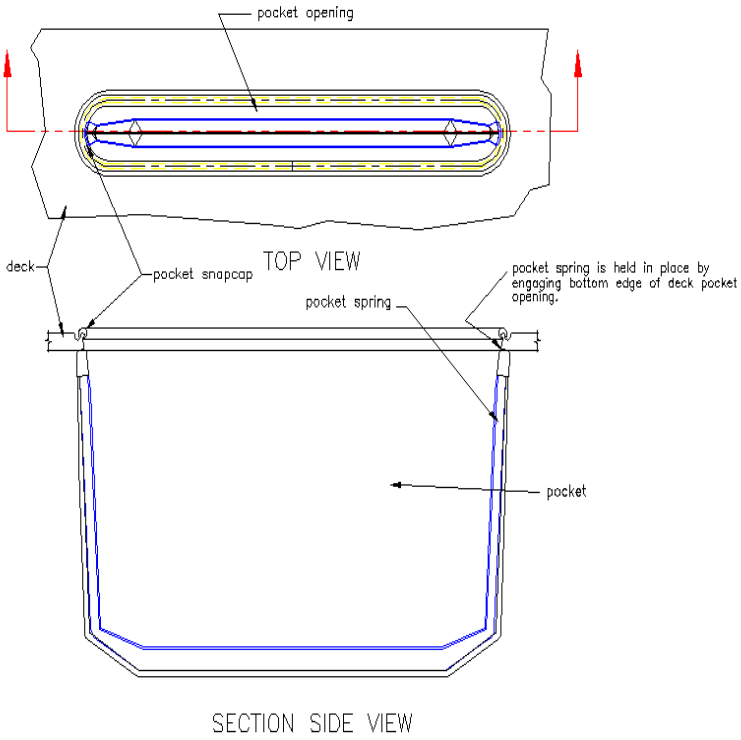


Figure 7-7: *Pocket/Pocket Spring Configuration*



Deck

Tools Required

- #2 Phillips screwdriver

Removal

1. Raise lid to its fully opened position.
2. Remove all the deck mounting screws.
3. Disconnect deck heater circuit at connection terminal located at rear of unit under the motor box cover.
4. Remove deck by lifting straight up until the bottom of the pockets clear the stainless steel top of chassis.
5. Unclip rod at bottom of pocket before removing deck (see Section *Removing and Replacing a Pocket –P/N's 8-1100-27 and 8-1101-27* — Chapter 5).

Installation

1. Place deck over chamber opening and lower onto chassis.
2. Align mounting holes of deck to corresponding tapped holes of chassis.
3. Install the deck mounting screws.
4. *(For P/N's 8-1100-20/21/23 and 8-1101-20/21/23)* Check pocket spring installation to ensure they engage under lip of deck opening (Figure 7-7). *(For P/N's 8-1100-27 and 8-1101-27)* Re-attach pockets according to instructions in Section *Removing and Replacing a Pocket – P/N's 8-1100-2 and 8-1101-27* — Chapter 5).
5. Reconnect deck heater circuit at connection terminal located inside metal housing at rear of unit under the motor box cover.

Motorbox Cover

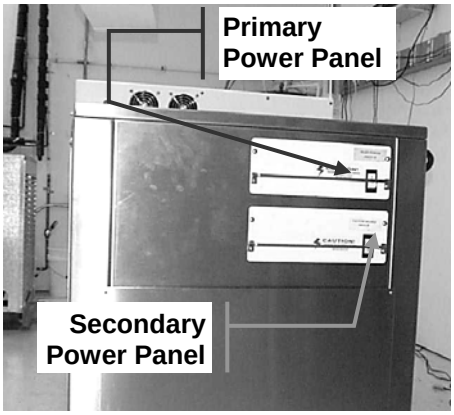
Tools and Supplies Required

- #2 Phillips screwdriver

Removal

1. Turn unit power off at switch located on primary power panel (Figure 7-8).

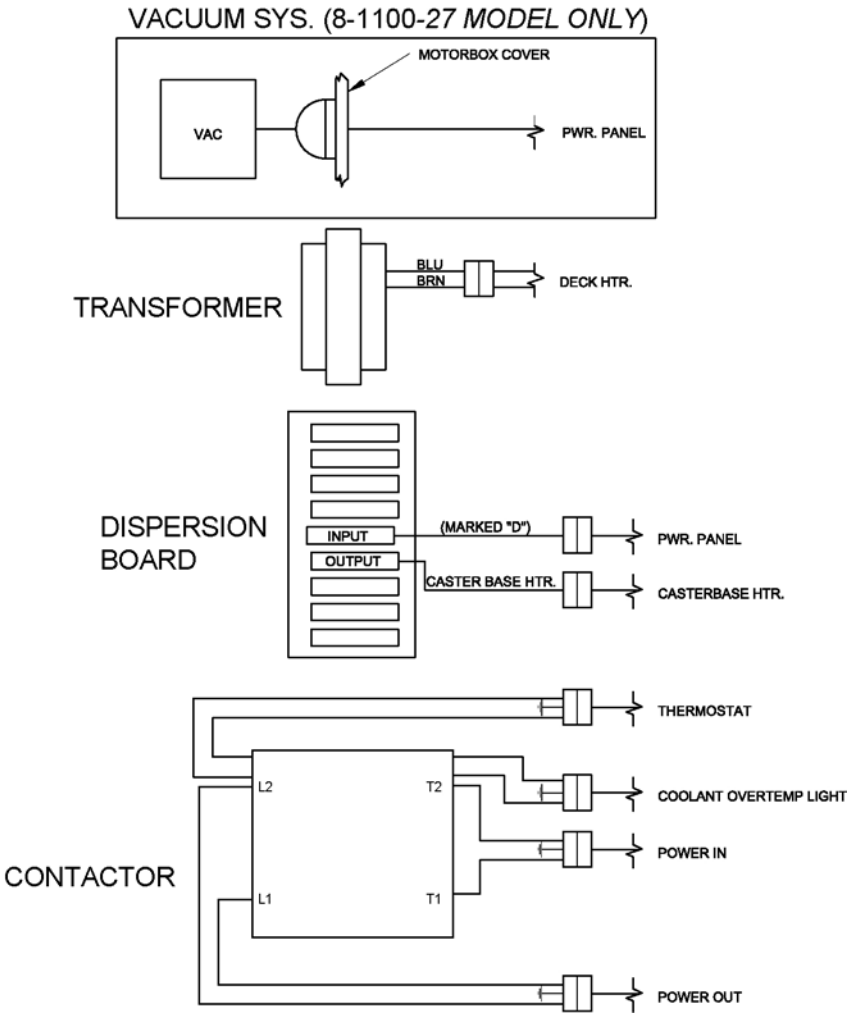
Figure 7-8: *Power Panel OFF/ON Switch*



2. Remove electrical plug from power source. If hardwired to power source, then turn power off at supply panel.
3. Place protective covering over top of condensing housing. (The condensing housing will act as a temporary workbench for this operation).
4. Remove four screws that mount motorbox cover stainless steel tie brackets to freezer chassis located at rear of unit.
5. Carefully lift back of motorbox cover until brackets clear top of chassis. Slide cover toward front of unit until inner flange of cover clears chassis mounting guide/holddown.
6. Remove motor box cover *(P/N's 8-1100-27 and 8-1101-27)*. The vacuum hose will need to be removed before the motor box cover is moved toward the front (Figure 7-9).

See next page

Figure 7-9: *Motor Box Schematic*



7. Rotate motorbox to its side and place on top of condensing housing.

NOTE: If a circuit is disconnected, see Figure 7-9 to reconnect.

Installation

1. Place motorbox cover on its side on top of condensor housing.
2. Lower motorbox cover over motor assembly until tie brackets contact top of freezer chassis. Make sure spiral wrapped cables are routed over the left side of motor mounting plate.
3. Slide motorbox cover toward front of unit approximately two inches. While lifting front, align slot in motorbox cover flange with chassis mounting guide/holddown.

4. Lower front of motorbox cover and slide it toward rear allowing tie brackets to drop down into place at back of unit.
5. Lift up on the front of motorbox cover to make sure slotted flange engaged chassis mounting guide/holddown. If it does not, perform steps 8-10 taking care to ensure engagement of slot and guide/holddown.
6. Install four screws that mount tie brackets to chassis. *(P/N's 8-1100-27 and 8-1101-27)* The vacuum hose will need to be installed before installing the four screws that mount the brackets to the chassis.

CAUTION: DO NOT over tighten.

7. Reconnect to power source.
8. Turn power to unit on and verify operation per startup process in Section *Starting the MP1100 Plasma Freezer* – Chapter 3.
9. If, during the repair process, the temperature of the InstaCoolant has risen significantly, refer to Section *Temperature Pulldown* – Chapter 3.

Control Panel

Tools and Supplies Required

- #2 Phillips screwdriver
- 11/32" nutdriver or socket wrench
- ESD protective bag

Removal

1. Turn unit power off at switch located on primary power panel (Figure 7-8).
2. Unplug unit from power source. If hardwired to power source, then turn power off at supply panel.
3. Using screwdriver, remove the panel mounting screws.
4. Lift up one edge of panel to get a finger grip, then lift panel up to remove it from control box.
5. Turn panel over and disconnect ribbon cables at back of panel.
6. Using nutdriver, unscrew grounding nut and remove ground wire from grounding stud on back of panel.
7. Place panel in an ESD bag and seal it. Keep sealed in bag until ready to re-install.

Installation

1. Remove panel from ESD bag.
2. Re-install ground wire onto grounding stud. Sequence of installation from panel is as follows: star washer, nut, starwasher, ground ring terminal, starwasher, nut.

3. Re-connect ribbon cables ensuring full engagement of connections.
4. Place panel on flange of control box opening.
5. Re-install the panel mounting screws.

CAUTION: DO NOT over tighten.

Power Panel

Tools and Supplies Required

- #2 Phillips screwdriver
- 1/4" nutdriver or socket wrench

Removal

1. Turn unit power off at switch located on power panel (Figure 7-8).
2. Unplug unit from power source. If hardwired to power source, turn power off at supply panel.
3. Place covering on top of condensing housing to protect surface.
4. Remove four screws that mount power panel to condensor housing (Figure 7-7).
5. Disconnect all wires and cables from back of power panel.
6. Using nutdriver, remove grounding wire from grounding terminal.
7. Remove panel by lifting out of condensor housing opening.

Installation

1. Remove panel from packaging.
2. Place panel through opening in right side of condensing housing.
3. Re-install ground wire onto grounding stud. Sequence of installation from panel is as follows: star washer, nut, starwasher, ground ring terminal, starwasher, nut.
4. Reconnect wires and cables ensuring full engagement of connections.
5. Re-install the four panel mounting screws**.**

CAUTION: DO NOT over tighten.

Probe Box

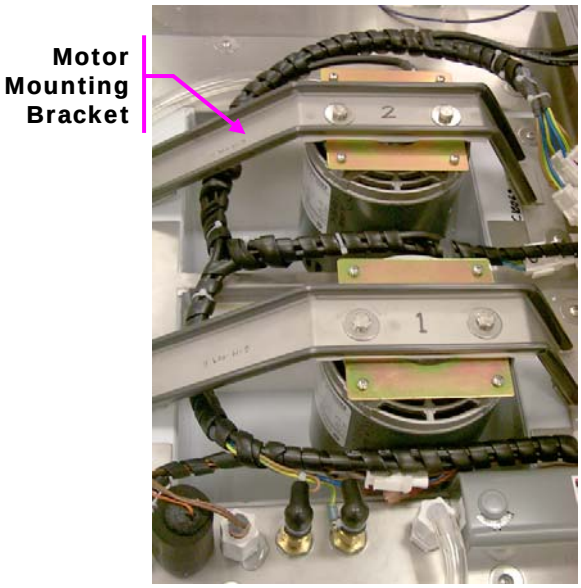
Tools and Supplies Required

- #2 Phillips screwdriver
- 1/4” nutdriver or socket wrench
- 7/16” inch nutdriver or socket wrench

Removal

1. Turn unit power off at switch located on primary power panel (Figure 7-7).
2. Unplug unit from power source. If hardwired to power source, turn power off at supply panel.
3. Place covering on top of condensor housing to protect surface.
4. Remove motorbox cover per Section *Motorbox – Removal and Installation*.
5. Remove four truss-head motor support bracket mounting screws including guide/holddown and loop clamp (Figure 7-10).

Figure 7-10: *Motor Mounting Bracket Connections*

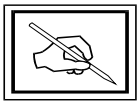


6. Remove two hex cap-head motor support bracket mounting screws (Figure 7-10).
7. Remove motor support bracket.
8. Remove remaining four truss-head screws, which mount both stainless steel seal plate and probe box to chassis.
9. Remove plastic spiral cable wrap and multi cable loop clamp from cables and wire.
10. Separate wires and cables to their corresponding assemblies. This will aid in removal of probe box and motorbox.
11. Lift out probe box and metal cover plate assembly by pulling straight up until the assembly clears top of freezer chassis.

CAUTION: If storing probe box assembly for later installation, lay in flat position and support the heater and probes to keep weight of assembly off these components.

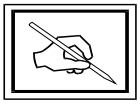
Installation

1. Lower the probe box and metal cover assembly into the reservoir through opening at right side of unit.
2. Position motor support bracket over motor mounting plate and install two, ¼-20 hex cap-head screws and fender washers. Do not tighten screws at this time. (Figure 7-9).
3. Bundle together chassis and pump motor cables, and defrost heater terminal wires, and install spiral wrap.



NOTE: Do not include temperature control cable in the bundle.

4. Bundle together temp control and chassis cables and install multi-cable loop clamp.
5. Install truss-head screw.
6. Repeat for single loop clamp attached to temperature control cable.
7. Install two remaining probe box mounting screws.
8. Install guide/holddown.



NOTE: Fender washer should be up against head of screw with brass spacer between fender washer and motor support bracket.

9. Install two remaining motor support bracket mounting screws.
10. Tighten all eight truss-head mounting screws.
11. Install motorbox cover per Section *Motorbox Cover Removal and Installation*.

Motorbox – Removal and Installation

Tools and Supplies Required

- #2 Phillips screwdriver
- ¼" nutdriver or socket wrench
- 5/16" nutdriver or socket wrench
- 7/16" inch nutdriver or socket wrench

Removal

1. Turn unit power off at switch located on primary power panel (Figure 7-8).
2. Unplug unit from power source. If hardwired to power source, then turn power off at supply panel.
3. Place covering on top of condensor housing to protect surface.
4. Remove motorbox cover per Section *Motorbox – Removal and Installation*.
5. Remove probe box per Section *Probe Box*.

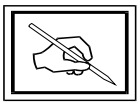
6. Remove the motor mount bracket using a Phillips screwdriver to remove the screws.
7. Remove middle vacuum seal bracket located between the motorbox assemblies.
8. Lift out motorbox assembly by pulling straight up on the assembly.
9. Once motorbox assembly has cleared the top of the chassis, place assembly on top of chassis at an angle which would allow access to pump hose connection.
10. Loosen pump discharge hose clamp with 5/16" nutdriver and remove hose from pump. Remove hose clamp from hose and store with motorbox assembly.
11. Remove motorbox assembly enough so that it just clears the coolant. Tip assembly on discharge side and allow remaining coolant in pump to drain back into reservoir.
12. Remove motorbox assembly completely from reservoir and place on its side.

CAUTION: Motorbox assembly is top-heavy and will easily fall over if placed upright on pump housing.

Installation

1. Place assembly on top of chassis at an angle. Orient the assembly so that motor will be toward the back when replaced.
2. Install hose and hose clamp on pump discharge fitting and tighten with 5/16" nutdriver.
3. Apply a bead of silicone caulking on the underside of the flanges and lower motorbox assembly down into position.
4. Install middle vacuum seal bracket.
5. Install the motor mount bracket(s).
6. Install probe box according to instructions in Section *Probe Box*.
7. Install motorbox cover.
8. Reconnect unit to power source.
9. Turn power onto unit and verify operation per startup process in Section *Starting the MP1100 Plasma Freezer* – Chapter 3.
10. If, during the repair process, the temperature of the InstaCoolant has risen significantly, refer to Section *Temperature Pulldown* – Chapter 3.

Motorbox – Disassembly and Assembly



NOTE: See drawing P/N 7-65-046 in *Reference Drawings* – Chapter 9.

Tools and Supplies Required

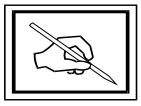
- #2 Phillips screwdriver
- ¼" nutdriver or socket and ratchet
- 5/16" nutdriver or socket and ratchet
- 7/16" nutdriver or socket and ratchet
- 1/8" Allen wrench
- 1 tube, high vacuum grease
- 1 each, caulking tube of Bostik 1100FS

Disassembly

1. Turn unit power off at switch located on primary power panel. (Figure 7-8).
2. Unplug unit from power source. If hardwired to power source, then turn power off at supply panel.
3. Remove motorbox cover per Section *Motorbox – Removal and Installation*.
4. Remove probe box per Section *Probe Box*.
5. Remove motorbox per Section *Motor Box – Removal and Installation* and place it on its side.
6. Using 5/16" nut driver, remove the eight hex head screws that secure the pump base to the pump head.
7. Remove pump impeller from end of drive shaft.
8. Loosen 1-½" compression nut located at base of motorbox. Column of pump assembly should now slide freely through gray PVC nipple.
9. Slide column up through motorbox enough to provide access to Hex head bolts that secure motor to column. Loosen the three bolts. (It is not necessary to remove them).
10. Pull motor, drive shaft coupler, and drive shaft out through column/pump head assembly.
11. Using 1/8" Allen wrench, loosen the coupler set screw which secures the pump drive shaft. Remove the drive shaft.
12. Loosen the coupler set screw, which secures the motor drive shaft and remove the coupler from the motor.
13. Remove the aluminum bushing/seal from the motor drive shaft.
14. Remove column/pump head assembly from motorbox by sliding out through nipple.

Assembly

1. Inspect aluminum bushing/seal for damage or excessive wear and replace if necessary.
2. Fill seal trough with high vacuum grease and install bushing on motor drive shaft with bushing flange toward motor.
3. Install coupler onto motor shaft and tighten coupler set screw.
4. Install pump drive shaft in coupler and tighten coupler set screw.
5. Inspect bearing of pump head for damage or excessive wear. Replace if necessary.
6. Slide column/pump head assembly through bottom of motorbox.
7. Install motor/drive shaft assembly down through column ensuring that column end fully seats into hub of motor.
8. Orient Motor relative to pump discharge as shown in drawing P/N 7-65-046 in *Reference Drawings* – Chapter 9.
9. Tighten the three hex head screws that secure the motor to the column.
10. Inspect impeller for damage or excessive wear and replace if necessary.
11. Install impeller on to drive shaft.
12. Inspect white caulked sealing surface between pump head and pump base. Sealing surface should be continuous with no breaks or junctions. If breaks exist, then clean old caulk from pump head and/or base and apply a continuous new bead of caulk.



NOTE: Let caulk cure for 15 minutes before proceeding to next step.

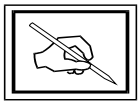
13. Install pump base to pump head.
14. Orient pump assembly in motorbox as shown in drawing P/N 7-65-046 in *Reference Drawings* – Chapter 9.
15. Slide pump assembly through motorbox until hub of motor rests approx. ¼" from inner bottom of motorbox.
16. Hand-tighten compression nut on threaded nipple at motorbox bottom to secure column from movement.

CAUTION: Compression nut will break if over-tightened.

17. Install motorbox per Section *Motor Box – Removal and Installation*.
18. Install probe box per Section *Probe Box*.
19. Install motorbox cover per Section *Motorbox – Removal and Installation*.
20. Reconnect unit to power source.

21. Turn power onto unit and verify operation per startup process in Section *Starting the MP1100 Plasma Freezer* – Chapter 3.

Defrost Heater



NOTE: See drawing P/N 7-65-018 in *Reference Drawings* – Chapter 9.

Tools and Supplies Required

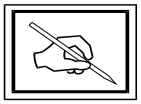
- #2 Phillips screwdriver
- ¼" nutdriver or socket and ratchet
- 5/16" nutdriver or socket and ratchet
- 7/16" nutdriver or socket and ratchet
- 5/8" open-end wrench
- 2 each, 4 inch cable ties

Removal

1. Turn unit power off at switch located on primary power panel (Figure 7-8).
1. Unplug unit from power source. If hardwired to power source, then turn power off at supply panel.
2. Remove motorbox cover per Section *Motorbox – Removal and Installation*.
3. Remove probe box per Section *Probe Box*.
4. Remove thermal bulb heater bracket from heater. Secure bulb out of way.
5. Cut cable ties from coil nipples (rubber boots) and remove from heater terminals.
6. Remove nuts, washers, electrical wires, and insulators from heater terminals. (Note sequence of removal).
7. Using 5/8" wrench, remove compression nuts from heater.
8. Slide heater up to reveal ferrules (compression bushings). Loosen ferrules and remove from heater.
9. Slide heater down through compression fittings to remove.

Installation

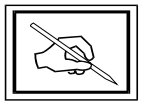
1. Slide new heater up through compression fittings until approximately 3" of heater (including terminals) protrudes above fittings.
2. Install new ferrules onto heater and lower heater into compression fittings until approximately ¼" of heater remains above fitting (not including terminals).
3. Install compression nuts and tighten. Be sure to keep heater stationary in order to maintain ¼" location indicated in step 2.
4. Install insulators onto heater terminals.
5. Install in sequence: nut-washer-terminal-washer-nut.



NOTE: Be sure to connect BROWN and BLUE wires to heater terminals according to drawing P/N 7-65-018 in *Reference Drawings* – Chapter 9.

6. Install coil nipples over heater terminals and secure with cable ties.
7. Install thermal bulb heater bracket with bulb oriented vertically.
8. Install probe box per Section *Probe Box*.
9. Install motorbox cover per Section *Motorbox – Removal and Installation*.
10. Reconnect unit to power source.
11. Turn power onto unit and verify operation per startup process in Section *Starting the MP1100 Plasma Freezer* – Chapter 3.

Safety Thermostat



NOTE: See drawing P/N 7-65-018 in *Reference Drawings* – Chapter 9.

Tools and Supplies Required

- Razor Blade
- #2 Phillips screwdriver
- ¼" nutdriver or socket and ratchet
- 5/16" nutdriver or socket and ratchet
- 7/16" nutdriver or socket and ratchet
- 5/8" open-end wrench
- 2 each, ESD protective bags
- 2 feet, cork insulation tape

Removal

1. Turn unit power off at switch located on primary power panel (Figure 7-8).
2. Unplug unit from power source. If hardwired to power source, then turn power off at supply panel.
3. Remove motorbox cover per Section *Motorbox – Removal and Installation*.
4. Remove cork insulation tape from around both defrost heater temperature probe and sensor temperature probe.
5. Remove rubber stopper from compression fitting of defrost heater temperature probe.
6. Remove thermal bulb wire of probe from side of rubber stopper.
7. Remove thermal bulb heater bracket from defrost heater.
8. Slide probe up through fitting.
9. Loosen securing screw of temperature probe thermostat cover.
10. Remove two each, thermostat mounting screws and remove thermostat.

Installation

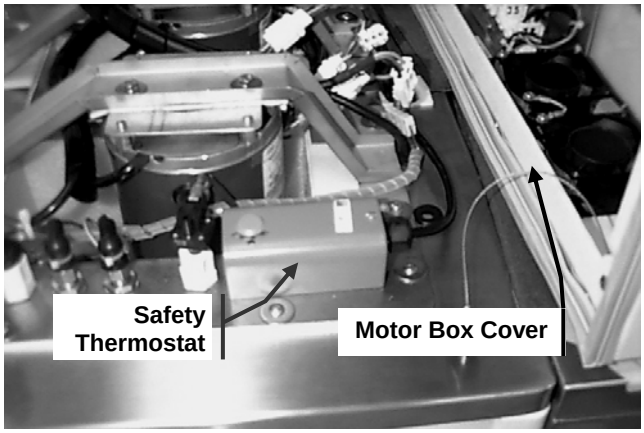
1. Loosen cover securing screw and remove cover from new temperature probe thermostat.
2. Locate thermostat over mounting holes of probe box bracket and install two-each 6-32x3/8 screws.
3. Reinstall cover and set thermostat to 80°F (27°C).
4. Slide bulb of probe through compression fitting.
5. Install thermal bulb heater bracket onto defrost heater with bulb oriented vertically per drawing P/N 7-65-018 in *Reference Drawings* – Chapter 9.
6. Feed probe wire through side of rubber stopper and snuggly insert into top of compression nut.
7. Wrap sensor temperature probe with cork insulation tape (include fittings).
8. Install probe box per Section *Probe Box*.
9. Install motorbox cover per Section *Motorbox – Removal and Installation*.
10. Reconnect unit to power source.
11. Turn power onto unit and verify operation per startup process in Section *Starting the MP1100 Plasma Freezer* – Chapter 3.

Adjusting the Safety Thermostat

Temporarily adjust the safety thermostat for a higher temperature (see Section *Safety Precautions* – Chapter 1). The thermostat is normally set to 80°F (27°C). The coolant is usually at room temperature (75°F to 85°F (24°C to 29°C)) when it is added to the freezer. Therefore, the safety thermostat must be set slightly higher than the coolant temperature during the freezer pull-down to operating temperature.

1. Remove the motor box cover by the following method:
2. Remove the four screws holding the rear of the motor box cover.
3. At the front of the freezer, gently lift the rear of the motor box cover about 2” and gently pull the cover toward you until you can lift it upward from the front.
4. Tilt the motor box cover on its right side (Figure 7-11).
5. At the right front of the motor box is the safety thermostat (Figure 7-11).

Figure 7-11: *Safety Thermostat*



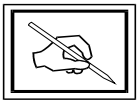
6. With a small flat head screwdriver remove the small round gray plastic cover over the adjusting screw for the temperature.
7. Insert a small flat blade screwdriver in the adjustment screw and adjust the temperature to indicate 80°F. Adjust the temperature higher if the coolant is higher than 80°F. The lights on the unit will come on when you reach the right temperature.
8. Replace the motorbox cover over the motorbox, but do not secure the cover to the MP1100 chassis.
9. Make sure the unit is properly plugged into the wall, then turn on the power switch.

NOTE: There is a built-in 2 to 5 minute time delay once the power is turned on before the high-stage compressor turns on, along with the condenser cooling fans. Thirty seconds after the high stage compressor starts, the low stage compressor will start.

10. After the MicroCascade™ refrigeration system starts, the MP1100 Freezer will begin to chill the InstaCoolant to the set operating temperature.

NOTE: In order to maintain a consistent temperature while the unit is not being used, the pump motor will start filling and circulating coolant in the left chamber until set operating temperature is reached. To remove or insert product, start a cycle in the right chamber.

Sensor Temperature Probe



NOTE: See drawing P/N 7-65-018 in *Reference Drawings* – Chapter 9.

Tools and Supplies Required

- Razor Blade
- #2 Phillips screwdriver
- 1/4" nutdriver or socket and ratchet
- 5/16" nutdriver or socket and ratchet
- 7/16" nutdriver or socket and ratchet
- 5/8" open end wrench
- 2 feet, cork insulation tape

Removal

1. Turn unit power off at switch located on primary power panel (Figure 7-8).
2. Unplug unit from power source. If hardwired to power source, then turn power off at supply panel.
3. Remove motorbox cover per Section *Motorbox – Removal and Installation*.
4. Remove probe box per Section *Probe Box*.
5. Remove cork insulation tape from around both Defrost Heater Temperature Probe and Sensor Temperature Probe.
6. Remove foam insulation tube from Sensor Temperature Probe.
7. Loosen compression nut from fitting.
8. Slide probe and compression nut up through fitting.

Installation

1. Remove compression nut and plastic ferrule (compression bushing) from old Sensor Temperature Probe and install on new probe at approximately the same location.
2. Slide new Sensor Temperature Probe through compression fitting until ferrule seats into compression fitting.
3. Tighten compression nut approximately 3/4 turn beyond tight.
4. Wrap both Defrost Heater Temperature Probe and Sensor Temperature Probe with cork insulation tape (include fittings).
5. Install probe box per Section *Probe Box*.
6. Install motorbox cover per Section *Motorbox – Removal and Installation*.
7. Reconnect unit to power source.
8. Turn power onto unit and verify operation per startup process in Section *Starting the MP1100 Plasma Freezer* – Chapter 3.

Chamber

Tools and Supplies Required

- #2 Phillips screwdriver
- 5/16" nutdriver or socket wrench
- 7/16" nutdriver or socket wrench
- ½" nutdriver or socket wrench

Removal

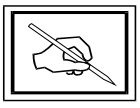
1. Turn unit power off at switch located on primary power panel (Figure 7-7).
2. Unplug unit from power source. If hardwired to power source, then turn power off at supply panel.
3. Remove deck per the instructions in this section.
4. Remove middle deck support bar.
5. Remove four, ¼-20 hex cap screws and lock washers, which mount chamber splash plate using 7/16 nutdriver.
6. Remove two, ¼-20 hex cap screws and lock washers, which mount chamber.
7. Remove chamber by gripping sides and lifting straight up.

Installation

1. Lower chamber onto chamber support bracket.
2. Align mounting holes and install two hex cap screws and lock washers. Do not tighten at this time.
3. Align splash plate mounting holes with that of chamber and chamber support bracket and install four hex cap screws and lock washers.
4. Tighten all six mounting screws.
5. Install deck support bracket onto chassis mounting clips.
6. Install deck per Section *Deck*.
7. Reconnect unit to power source.
8. Turn power onto unit and verify operation per startup process in *Section Starting the MP1100 Plasma Freezer* – Chapter 3.

Condensing Unit

CAUTION: Only a licensed refrigeration service technician should service the condensing unit.



NOTE: For service of the condensing unit, follow standard refrigeration practices and refer to the condensing unit manufacturer's service procedures.

Chapter 8
Parts List

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Parts List

Please Note:
Parts that are ordered but not listed here are considered a "Special Order" and are subject to availability and variable pricing. Although we will do everything in our power to expedite delivery there could be a lead time of **up to 6 weeks** to receive these parts. In the event that you frequently order parts not on this list we highly encourage you to maintain a small stock at your facility.

MP 1100's Models -20/21/23/27	
Part Description	**Part number**
2" White Foam Tape	2-33-002
Breaker Switch	1-27-020
Condenser Fan	1-15-030
Contactor, 30 amp	1-23-031
Desiccant Pack Replacement (1 lb package)	5-31-001
Display Front Panel, Two Timer	7-51-077
Dye, Blue Coloring	5-34-001
Fan	1-15-001
Gasket, Magnetic, Left Lid	6-53-011
Gasket, Magnetic, Right Lid	6-53-010
Hand Siphon Pump	2-72-026
Hinge, Lid	7-41-004
InstaCoolant IV Cubitainer (4.5 Gallons/17 Liters)	70024
InstaCoolant IV Drum (53 Gallons/200.6 Liters)	70025
Keypad Membrane	1-61-008
Manual, Operator/Service	37-00-053
Pocket Repair Kit	7-01-002
Primary Power Panel	7-51-003
Pump Assembly without Motor	7-03-006
Pump Coupler	2-00-008
Pump/Motor Box Assembly	7-65-046
Pump/Motor Assembly	7-26-011
Pump Shaft	6-13-011
Strain Relief Fitting	1-46-023

Model Specific Parts	
MP 1100-20	**Part Number**
Pocket	7-47-141
Pocket Spring	6-16-109
Secondary Power Panel	7-51-004
MP 1100-21	
Pocket	7-47-157
Pocket Spring	6-16-130
Secondary Power Panel	7-51-004

Continued on next page

Please Note:
Parts that are ordered but not listed here are considered a "Special Order" and are subject to availability and variable pricing. Although we will do everything in our power to expedite delivery there could be a lead time of **up to 6 weeks** to receive these parts. In the event that you frequently order parts not on this list we highly encourage you to maintain a small stock at your facility.

MP 1100-23	
Pocket	7-47-140
Pocket Spring	6-16-115
Secondary Power Panel	7-51-004
MP 1100-27	
Pocket	7-47-137
Secondary Power Panel	7-51-020

***** *The **Primary Components Kit** include: fan (230VAC, 50/60 Hz), adjustable hose clamp, clear urethane coolant hose, temperature sensor, primary control panel, secondary control panel, control panel, deck heater assembly and motor box assembly.*

Ordering Information

Contact Helmer Technical Service at 800.743.5637 (U.S./Canada) or +1.317.773.9092 (non-U.S./Canada), or fax your purchase order to +1.317.773.9082. Use the form in Appendix A to itemize your order.

Chapter 9
Reference Drawings

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7-35-118 9-2

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ITEM	PART #	QTY	DESCRIPTION
91	7-21-119	1	TUBE 26, CONDENSER, MICROCASCADE
90	7-21-118	1	TUBE 25, CONDENSER, MICROCASCADE
89	7-21-117	1	TUBE 24, CONDENSER, MICROCASCADE
88	7-21-116	1	TUBE 23, CONDENSER, MICROCASCADE
87	7-21-115	1	TUBE 22, CONDENSER, MICROCASCADE
86	7-21-114	1	TUBE 21, CONDENSER, MICROCASCADE
85	7-21-113	2	TUBE 3, CONDENSER, MICROCASCADE
84	7-21-112	1	TUBE 2, CONDENSER, MICROCASCADE
83	7-21-111	2	TUBE 1, CONDENSER, MICROCASCADE
82	7-21-110	1	TUBE 20, CONDENSER, MICROCASADE
81	7-21-109	1	TUBE 19, CONDENSER, MICROCASADE
80	7-21-108	1	TUBE 18, CONDENSER, MICROCASADE
79	7-21-107	1	TUBE 17, CONDENSER, MICROCASCADE
78	7-21-106	1	TUBE 16, CONDENSER, MICROCASCADE
77	7-21-105	1	TUBE 15, CONDENSER, MICROCASCADE
76	7-21-104	2	TUBE 14, CONDENSER, MICROCASCADE
75	7-21-101	1	TUBE 11, CONDENSER, MICROCASCADE
74	7-21-100	1	TUBE 10, CONDENSER, MICROCASCADE
73	7-21-099	2	TUBE 9, CONDENSER, MICROCASCADE
72	7-21-098	1	TUBE 9, CONDENSER, MICROCASCADE
71	7-21-097	1	TUBE 7, CONDENSER, MICROCASCADE
70	7-21-096	1	TUBE 6, CONDENSER, MICROCASCADE
69	7-21-095	1	TUBE 5, CONDENSER, MICROCASCADE
68	7-21-094	1	TUBE 4, CONDENSER, MICROCASCADE
67	7-21-093	1	ASSY, DISTRIBUTOR, 1/8 OD CAP TUBE
66	6-16-217	1	ASSY, CONDENSER BASE, MICROCASCADE
65	6-11-631	1	BRACKET, OIL SEPERATOR
64	6-11-625	1	BRACKET, HEAT EXCHANGER CLAMP
63	6-11-623	1	HEAT EXCHANGER BRACKET, MICROCASCADE
62	6-11-622	1	UPPER FAN SHROUD, MICROCASCADE
61	6-11-621	1	LOWER FAN SHROUD, MICROCASCADE
60	6-11-620	1	CONDENSER FRAME, MICROCASCADE
59	5-22-017	3 SQ FT	1/2" INSULATION SHEET
58	5-13-001	10 OZ	ADH CONTACT 1357 3M
57	4-67-037	1	ELBOW, COPPER, 45 DEG, 1-1/9 C x C
56	4-67-036	1	ELBOW, COPPER, 45 DEG, 1-1/8 C x C
55	4-57-036	2	COMPRESSOR MOUNTING KIT
54	4-57-024	9	VALVE, ACCESS, 1/4 TUBE EXTENSION
53	4-56-003	.5 LBS	SOLDER, SILVER, 15%
52	4-54-026	3.9 LBS	REFRIGERANT, R-508B
51	4-54-014	5 LBS	REFRIGERANT, R-507
50	4-53-022	1	SIGHT GLASS, 3/8 ODF
49	4-52-046	2	FILTER DRIER
48	4-52-045	1	BRAZED PLATE HEAT EXCHANGER
47	4-52-027	1	OIL SEPERATOR
46	4-51-062	1	CONDENSOR, MICROCASCADE
45	4-51-061	1	COMPRESSOR, HIGH STAGE, 1100 C.U.
44	4-51-060	1	COMPRESSOR, LOW STAGE, 1100 C.U.
43	4-39-036	3	REDUCER, COPPER, 1-1/8 X 1/2 FTG X C
42	4-39-035	1	REDUCER, COPPER, 1-1/8 X 3/4 FTGXC
41	4-39-034	1	REDUCER, COPPER 3/4 X 5/8 FTG X C
40	4-39-022	1	REDUCER, COPPER, 1-1/8X5/8 FTGXC
39	4-38-016	2	CAP, COPPER 5/8 C
38	4-38-003	5	CAP FLARED 1/4
37	4-37-069	2	ELBOW, COPPER, 3/4 X 90DEG FTGXC
36	4-37-027	1	ELBOW, 3/8 X 3/8
35	4-37-018	3	ELBOW, COPPER 5/8 CXC
34	4-37-013	2	ELBOW, COPPER 45 DEG 5/8 CXC
33	4-36-101	1	EXPANSION VALVE
32	4-36-100	1	SOLENOID VALVE
31	4-16-003	1	NUT, BRASS, FLAIR, 3/8
30	4-11-007	1.58 FT	TUBING, COPPER, 1/8 OD
29	2-61-002	1	FLUX, BRAZING, STAY SILV
28	2-24-070	1	CLAMP, ADJUSTABLE, 2 1/2-10
27	2-19-109	8	NUT LOCK NY, 5/16-18
26	2-19-041	1	NUT, HEX, 1/4-20
25	2-18-048	8	BOLT, HEX 5/16-18 X 2
24	2-18-017	1	BOLT, HEX 5/16-18 X 2
23	2-17-050	12	RIVET, BLIND, BUTTONHEAD, 1/8" DIA
22	2-13-140	4	SCREW, SELF DRILLING, 10-16 X 1/2
21	2-12-043	8	WASHER, LOCK SPNG 5/16
20	2-12-042	1	WASHER, LK SPR 1/4
19	2-11-035	4	WASHER, EXT TOOTH, 1/4, SS
18	2-11-009	1	WASHER, FLAT 1/4 x 1
17	2-11-006	2	WASHER, 1/4x5/8 FLAT
16	2-03-061	8	SCREW, HSC M6X20 SS
15	2-01-039	7	WASHER, SPLIT M6 SS
14	2-01-015	8	WASHER, FLAT M6 SS
13	1-73-007	10	TIE CABLE 4 IN.
12	1-71-227	2	CONNECTOR, RING, 1/4, 16-14 AWG
11	1-71-097	16	PIN, FEMALE SOCKET
10	1-56-003	2.3 FT.	HEATSHRINK, 1/8 IN.
9	1-56-002	2.5 FT.	HEATSHRINK, 1/2 IN.
8	1-37-016	5	CONN, 2-POLE MALE
7	1-37-015	2	CONNECTOR, 3 POLE MALE
6	1-36-021	2	THERMOSTAT, DISCHARGE LINE
5	1-29-003	1	REGULATOR, PRESSURE, LOW STAGE
4	1-21-065	1	HIGH PRESSURE SAFETY SWITCH, 1100 C.U.
3	1-21-064	2	LOW PRESSURE SAFETY SWITCH, 1100 C.U.
2	1-15-031	2	FAN, INLET RING
1	1-15-030	2	FAN, MICROCASCADE CONDENSING UNIT

14. SOLDER ALL FITTING JOINTS OF ASSEMBLY USING P/N 4-56-003 (ITEM 39).

15. CUT ALL SWITCH WIRES TO 12 ± 1" AND INSTALL FEMALE PINS AND 2 POLE MALE CONNECTOR (ITEM 8 AND 7).

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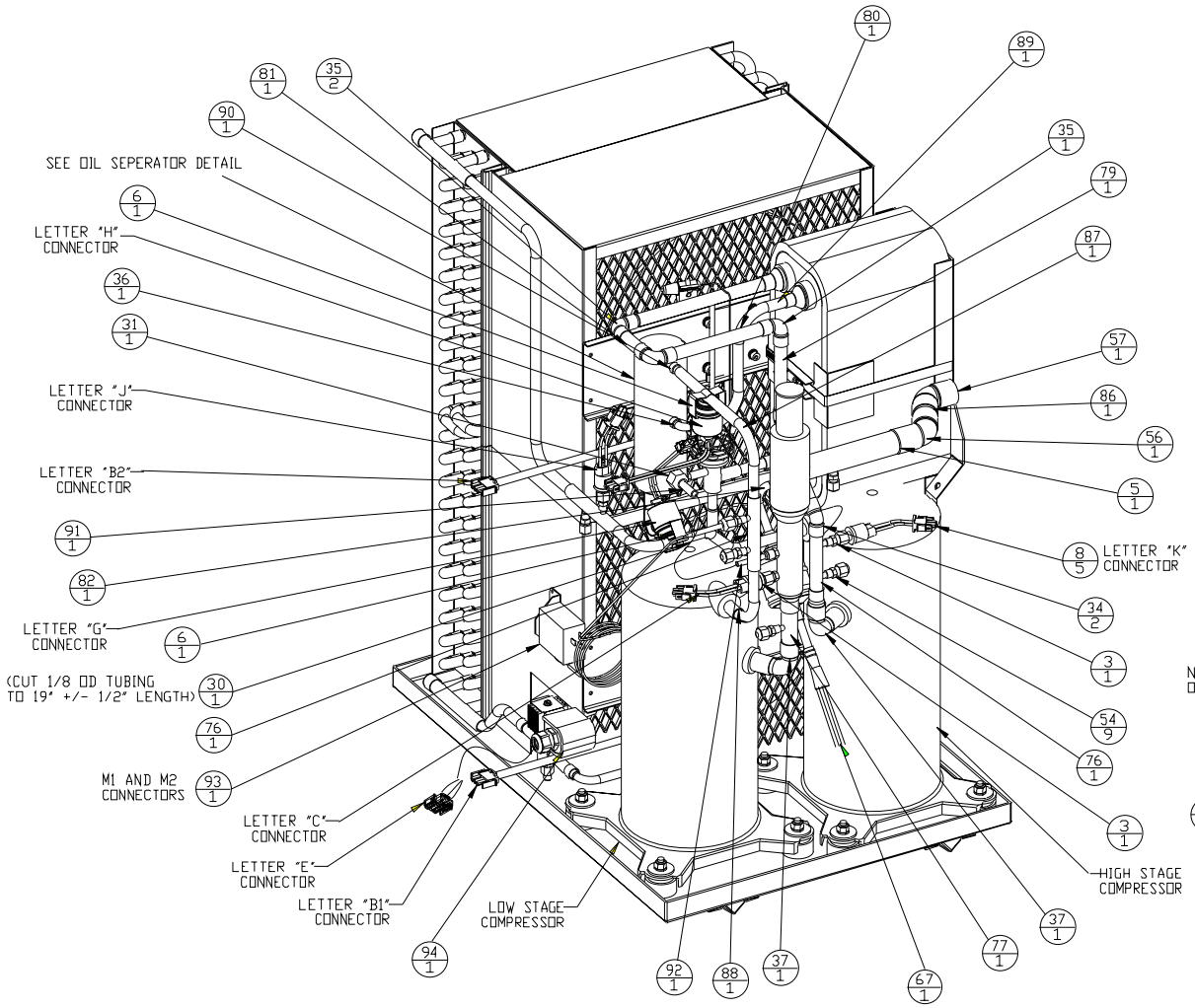
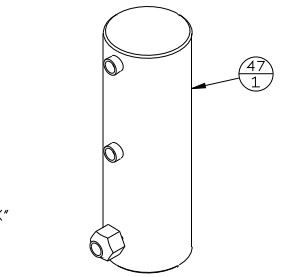
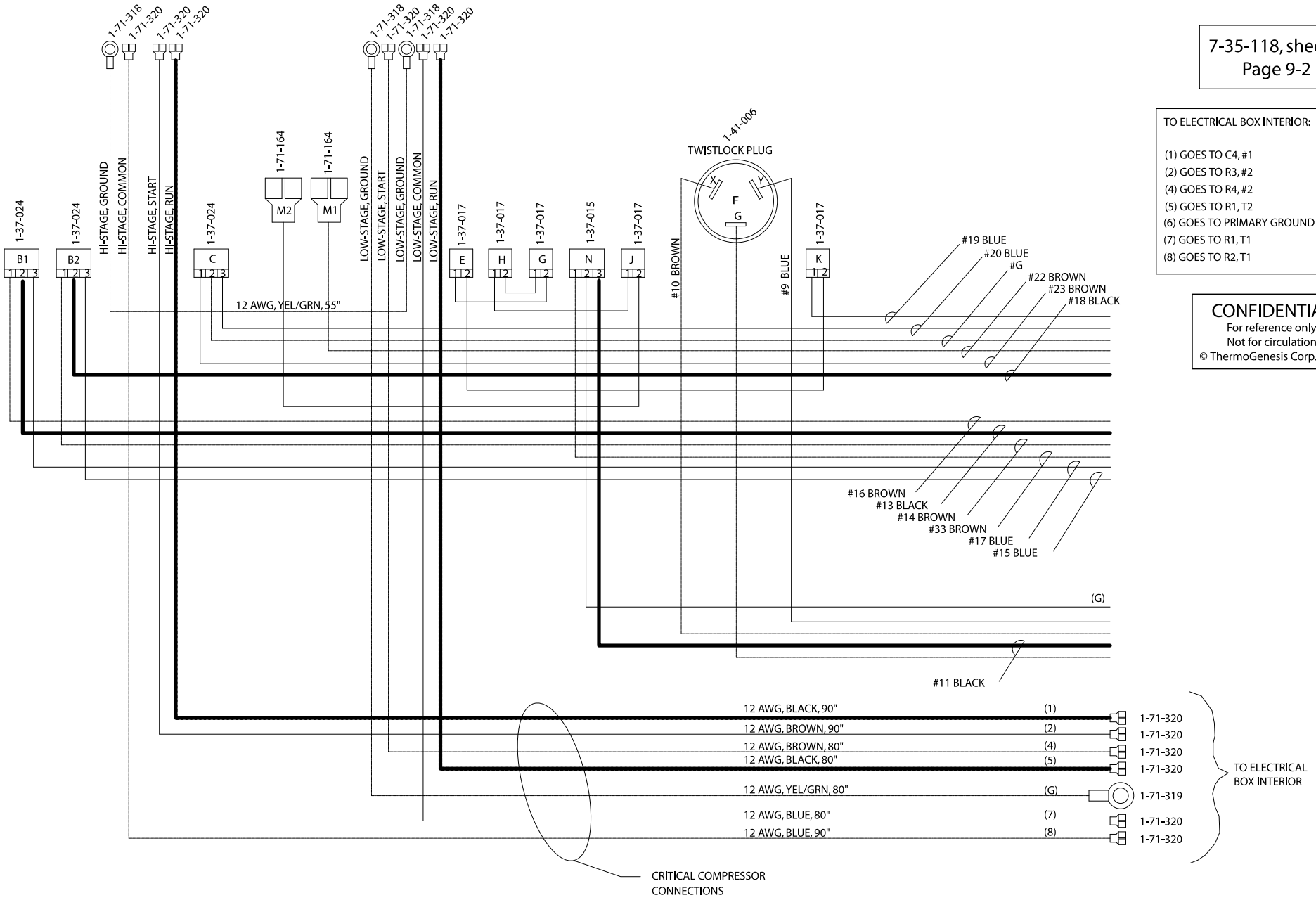




OIL SEPARATOR DETAIL



7-35-118, sheet 5
Page 9-2

TO ELECTRICAL BOX INTERIOR:

(1) GOES TO C4, #1
(2) GOES TO R3, #2
(4) GOES TO R4, #2
(5) GOES TO R1, T2
(6) GOES TO PRIMARY GROUND POINT
(7) GOES TO R1, T1
(8) GOES TO R2, T1

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PLUG #	DESCRIPTION
B1	TOP CONDENSOR FAN
B2	BOTTOM CONDENSER FAN
C	SOLENOID
F	PLASMA BATH MAIN POWER
E	LOW STAGE, LOW PRESSURE CONTROL
G	HIGH STAGE, DISCHARGE TEMP. SENSOR
H	LOW STAGE, DISCHARGE TEMP. SENSOR
J	HIGH STAGE, HIGH PRESSURE CONTROL
K	HIGH STAGE, LOW PRESSURE CONTROL
M	LOW STAGE, HIGH PRESSURE CONTROL
N	CONTROL POWER FOR ARC PANEL

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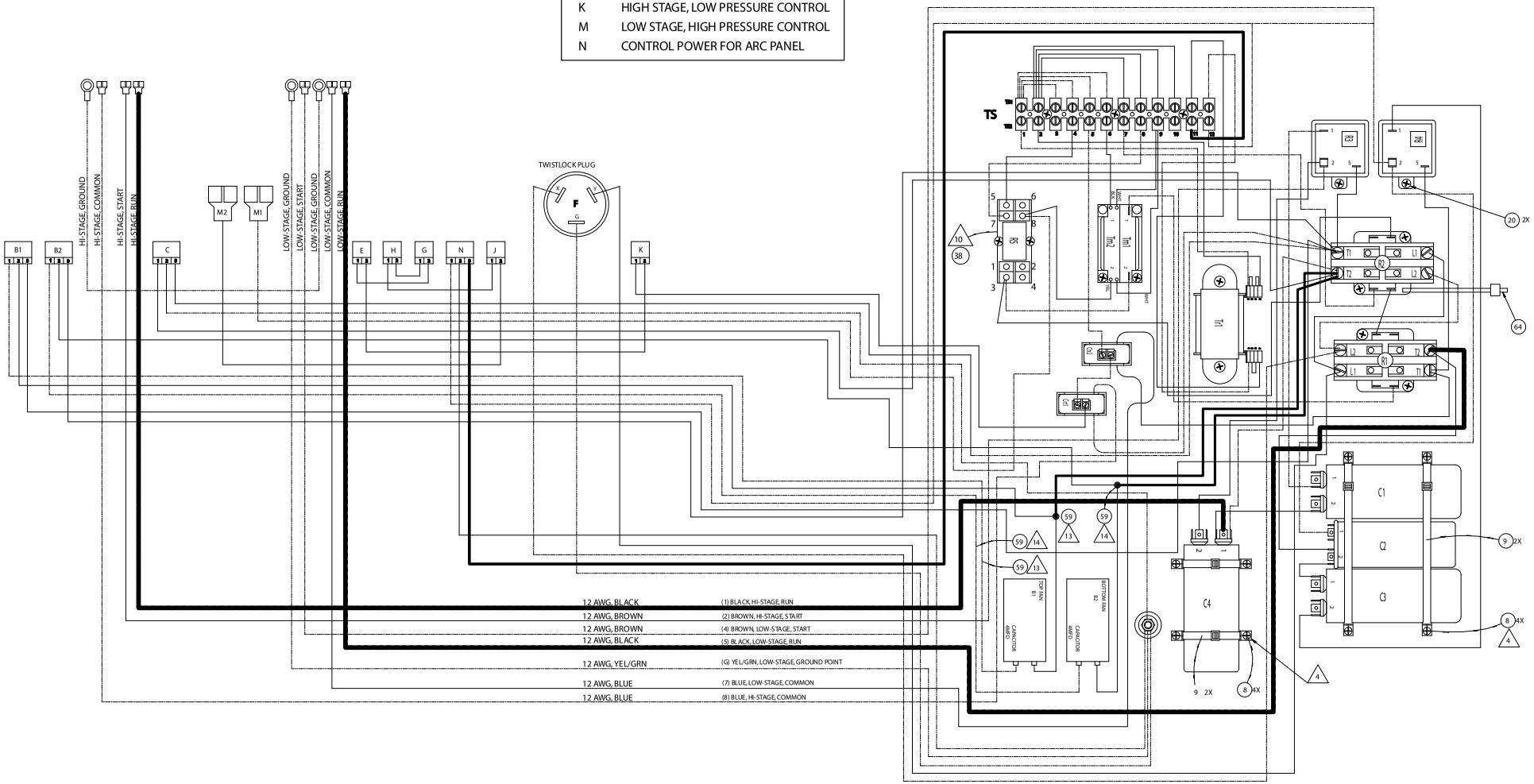

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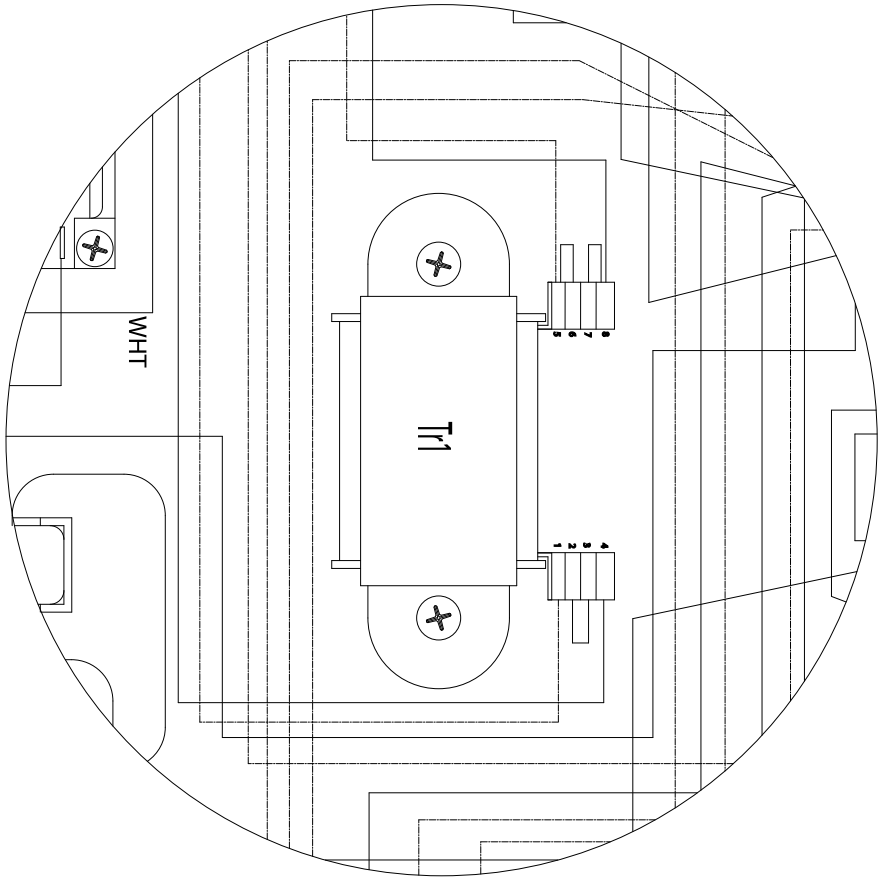
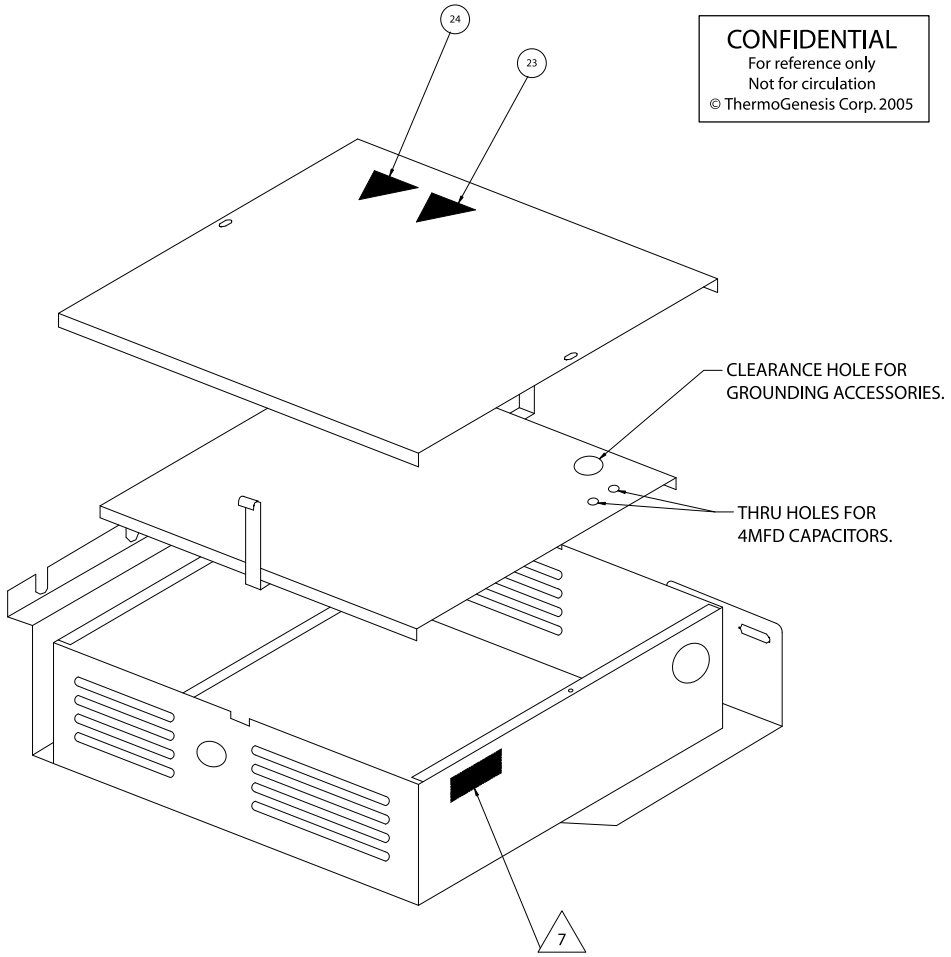


TRANSFORMER CONNECTION
DETAILS



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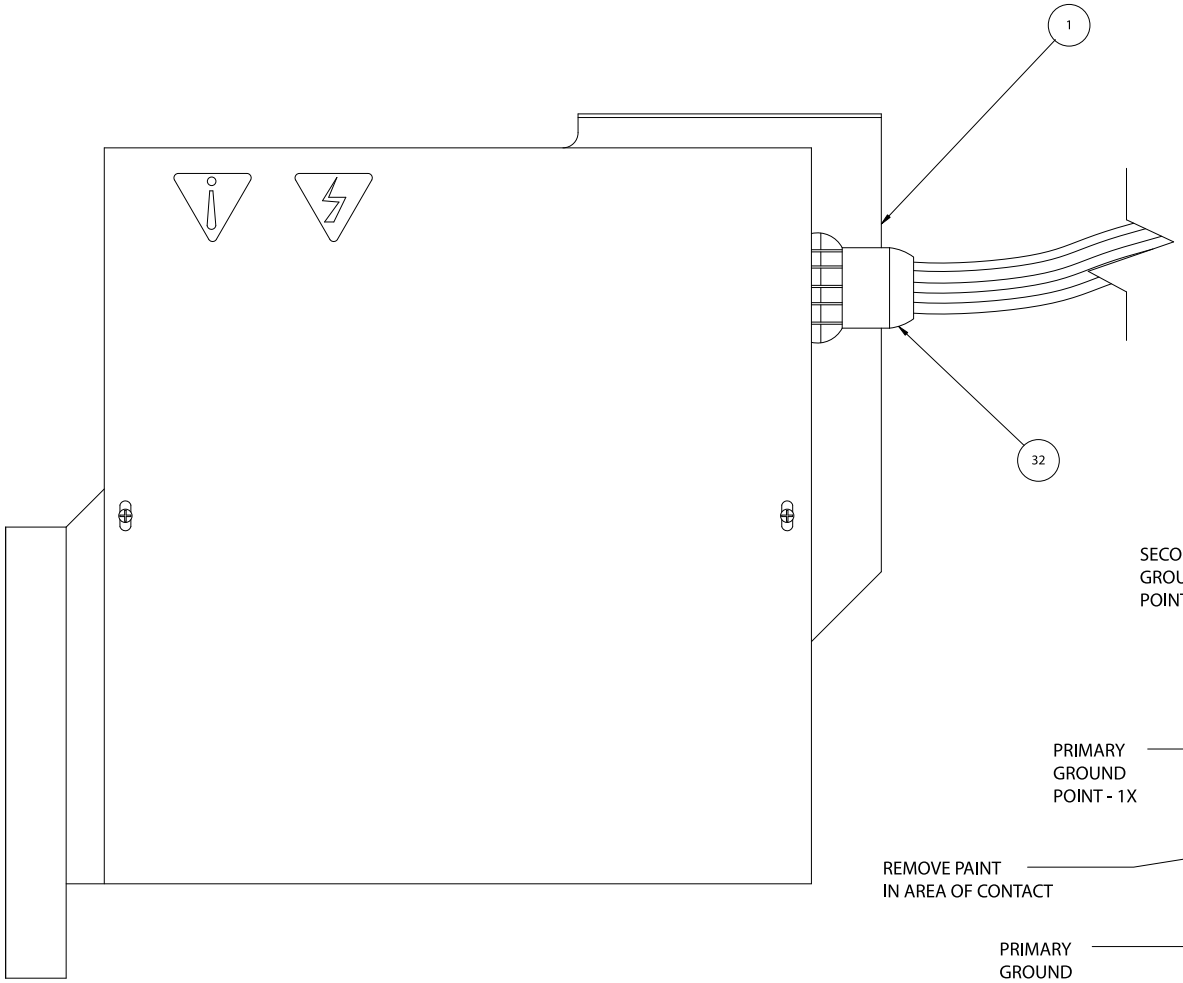

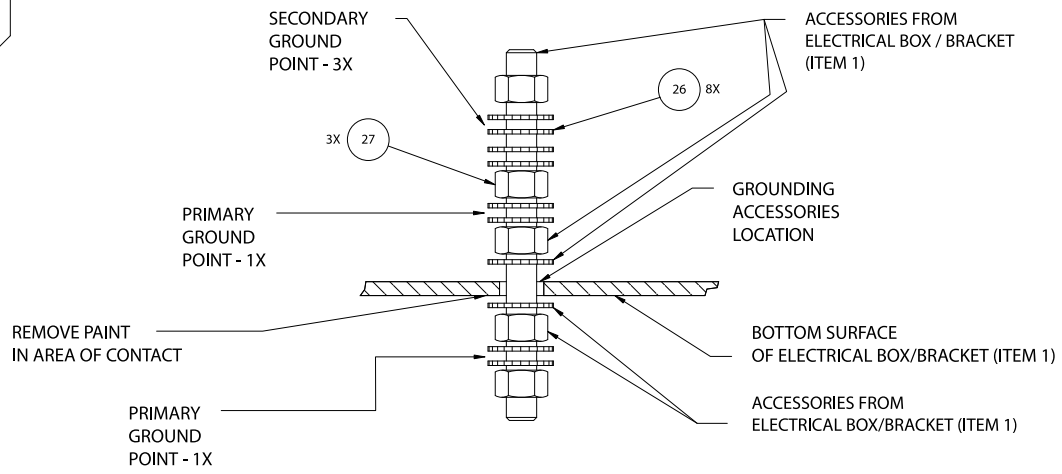

GROUNDING CONFIGURATION

NOTE: FOR SECONDARY GROUNDS STAR WASHER SHALL BE PLACED BETWEEN ADJACENT TERMINALS.

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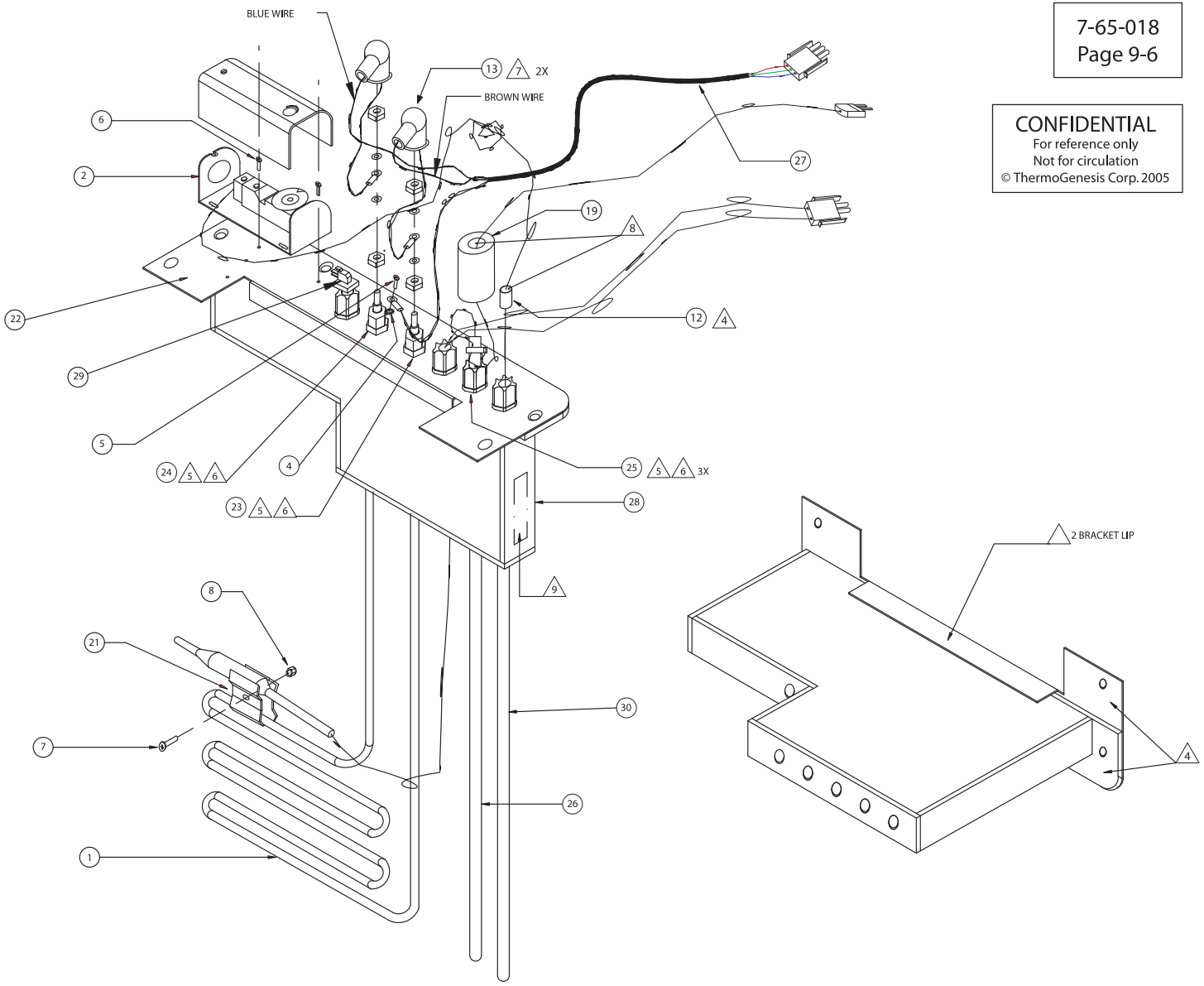

ITEM	QTY	PART NUMBER	DESCRIPTION
28	1 EA	7-46-007	CHAMBER, PROBE HOUSING
27	1 EA	7-34-042	HARNESS HEATER
26	1 EA	7-32-007	SENSOR TEMP
25	3 EA	6-55-159	FITTING, COMPRESSION, PP 1/2 X 1/2 NPT
24	1 EA	6-16-114	FITTING, COMPRESSION, HEATER, # 2
23	1 EA	6-16-113	FITTING, COMPRESSION, HEATER, # 1
22	1 EA	6-11-273	BRKT VAC SEAL FRONT #2
21	2 EA	6-11-271	BRKT BULB HEATER
20	0.01 OZ	5-41-005	GREASE HIGH VACUUM SIL
19	0.30 FT	5-22-014	TUBING, INSULATION 1/2"
18	———	Not used	———
17	———	Not used	———
16	———	Not used	———
15	———	Not used	———
14	1 FT	2-42-015	TAPE, GASKET, 1/2 X 1/32W
13	2 EA	2-41-025	COIL NIPPLE
12	1 EA	2-41-002	STOP RUB TEMP PROBE
11	5 FT	2-33-002	TAPE, FOAM, WHITE
10	0.20 FT	2-32-015	TAPE, CORK INSULATION, 1/8 X 2
9	2 FT	2-32-001	TAPE, TEFLON THREAD, 1/2"
8	1 EA	2-19-053	NUT, NY INS 8-32
7	1 EA	2-13-063	SCREW, PN 8-32 X 1/2
6	2 EA	2-13-012	SCREW, PN 6-32 X 3/8
5	1 EA	2-13-006	SCREW, PN 4-40 X 1/4
4	1 EA	2-12-006	WASHER, LK EXT TH #4, 18-8
3	2 EA	1-73-001	TIE, CABLE, 4"
2	1 EA	1-35-003	PROBE TEMP, -30/+100F
1	1 EA	1-16-019	HEATER, 220V 1000W

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